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Scaffolding.

CONSIDERING the great importance of scaffolding in building construction and kindred works, and the responsibilities that attach to those who make use of it, we are somewhat surprised that the subject has received so little attention from writers who have contributed so largely to the literature of building construction. While scaffolding is essentially of ephemeral character, it must be in every way well designed and securely built. Upon its design depend, to a considerable extent, convenience and economy in the erection of buildings of all kinds, and upon its security depend the safety and lives of workmen and others engaged in building operations. Moreover, recent legislation has imposed heavy responsibilities upon contractors who make use of scaffolding, for by the Workmen's Compensation Act, 1897, and the Factory and Workshop Act, 1901, such constructions are placed directly under the eye of the executive representatives of the law. Hence, much more attention is being devoted to the subject than was formerly the case, but unfortunately comparatively little technical information is available to the inquiring mind. This deficiency is now made good, at least in part, by the publication of a treatise by Mr. A. G. H. Thatcher,* a building surveyor who has had exceptional facilities for acquiring useful and trustworthy knowledge in this branch of constructive work.

To define the term "scaffolding" is an easy task if the only object be to instruct the uninitiated, but to formulate such a definition as will serve to indicate the uses of scaffolding, and at the same time to include all temporary supports legally considered to be scaffolds, appears to be found difficult. In Chapter I., Mr. Thatcher quotes definitions by several writers on building construction, none of which he considers to be entirely satisfactory in view of the wider meaning given to the term "scaffolding" by recent decisions under the Workmen's Compensation Act. We concur in this view, for all the definitions mentioned are too specific in stating the uses of scaffolding, and in describing the nature of the construction. The author proposes the following definition:—

> "A scaffold, as used in building, is a temporary arrangement of timbers combined and supported in various ways to enable workmen to proceed with their work, and where required, to afford facilities for the lifting and carrying of materials."

We have no wish to appear captious, but even this rendering cannot be accepted as a standard, for several reasons. In the first place, although timber is usually employed it need not necessarily be selected as the material of construction for the "temporary arrangement." Next, it is undesirable to use the plural number of the word "timber," for by recent decisions it has been established that a single plank, supported in any way, may constitute a scaffold within the meaning of the Act. Thus, it is neither necessary that "timbers" should be used nor that they should be "combined." Again, it is an undesirable limitation to say that the object of scaffolding is to enable workmen "to proceed with their work," and finally, the last phrase of the definition is needlessly narrow in scope.

We believe the following version would better express what the author desired to imply:—

> "A scaffold, as used in buildings and kindred work, is a temporary stand or stage of any material, consisting of one or two members, placed separately or in combination, supported in any way, and intended for the use of any workman or workmen employed on, in, or about a building, and, when required, to afford facilities for lifting, lowering, carrying, or otherwise dealing with materials, tools, and appliances used on, in, or about a building."

Thus we see that scaffolding is of two distinct types, one intended for enabling workmen to reach the required parts of a structure, and the other for handling materials and appliances. But it should be remarked that a combination of the two types is often adopted and found of much use in practice.

To a general description of these forms of scaffolding, Mr. Thatcher devotes the first chapter of the volume to which we now direct the attention of our readers. The "Northern System," once used only in Scotland and the North of England, is first dealt with, this kind of scaffolding including two divisions: (1) a derrick staging employed for the transport of material, and (2) platforms which bring the workmen within reach of their work.

The design of derrick stagings is usefully considered at some length, and drawings are reproduced showing general elevations of staging for derrick cranes, and details relating to the construction of shoring for the central standard, of the top platform, and indicating the method

* "Scaffolding: A Treatise on the Design and Erection of Scaffolds, Gantries, and Stagings." By A. G. H. Thatcher, Building Surveyor. London: B. T. Batsford, 1904.

of fixing ladders from the ground to the platforms. Other diagrams illustrate the construction of staging mounted upon travelling bogies, so that it may be moved from point to point along a range of buildings without the necessity for dismantling the temporary structure, and a method of applying mechanical power at different points by the employment of travelling cranes upon the platform of a staging.

Turning next to the "South Country System," Mr. Thatcher first discusses scaffolds built of square timbers, such as gantries for travellers, travelling gantries, gantries which serve as a base for lighter forms of scaffolding, and stagings similar to gantries but carried more than one story high. He then takes up pole scaffolds, as used by bricklayers, and the self-contained type used by stone-masons. All these forms of scaffolding are adequately illustrated, and the chapter serves to convey a sufficiently clear idea of their design as well as of the general details of construction and erection. Chapter II. is devoted to scaffolds for special purposes, and although the examples given do not cover more than a few of the varieties of scaffolding which may be necessary for coping with the difficulties frequently encountered in practice, they fairly represent the special types of construction that are in regular use, and may serve to suggest other modifications to the ingenuity of the builder. Among the forms here discussed we may mention scaffolds for chimneys, towers, steeples, domes, and arches, swinging scaffolds for painters, and ladder scaffolds. Hanging scaffolds are about the most dangerous devices of the kind employed in building work, and we are sorry that the author has not devoted more attention to the improved types of such apparatus which have already been introduced for the greater convenience of employers and safety of workmen.

"Shoring and Underpinning," which form the subject of Chapter III., can scarcely be regarded as varieties of scaffolding, although work of the kind has often to be performed by the scaffolder for the support of his temporary structures as well as for the support of buildings. On the whole, therefore, the inclusion of some notes on these subjects is to be welcomed. The method in which flying and raking shores are employed is briefly described and illustrated, but the treatment is somewhat superficial, and might have been extended with advantage. The same remark applies still more to the short reference to underpinning, a most important branch of work which does not always receive the amount of attention which it deserves.

Passing over Chapter IV., occupied with notes upon "Timber" and its selection for scaffolding purposes, we come to an instructive series of plates containing diagrams which illustrate the various rope knots used both in the erection of scaffolds and for attaching materials to hoists. The explanations of these diagrams and the accompanying notes upon ropes and cords will be found of practical use to the student; but we fully endorse the remark of the author that "half an hour with an expert scaffolder, preferably an old sailor, will afford more instruction than hours spent in studying diagrams." Little or no comment is necessary in the case of Chapters VI. and VII., the former entitled "Scaffolding Accessories and their Use" and the latter "The Transport of Material." One is a useful catalogue of auxiliary appliances and the other a brief review of the various forms of hoisting appliances in common use, with some hints as to the most suitable methods of applying simple hoisting tackle.

Two short chapters of this book are occupied with the theoretical aspect of scaffold construction, but we are sorry to say that the discussion is anything but satisfying. It is elementary and incomplete, and unless supplemented by knowledge already at the disposal of the reader, or obtained by him from other sources, will not suffice for the complete and scientific design of temporary works of the kind described. There is little, if any, room for adverse criticism of what the author actually says, but as will be seen presently, he leaves his readers without aid towards the solution of various important problems. Chapter VIII. commences with the statement that a scaffold is in a stable condition when, under the forces that may act upon it, it remains in a state of equilibrium. Then we are told that one of the forces which tend to create a loss of equilibrium is "the force of gravity due to the weight of the scaffold and that of attendant loads." The language in which this proposition is stated is admirably calculated to mislead those unacquainted with applied mechanics, for in a properly designed structure the weight of the material used cannot disturb equilibrium. There may be projecting parts which would tend to overturn the scaffold unless these were properly taken into account, but no structure of the kind can be said to be completely designed unless it is properly balanced and supported. "Attendant loads," if non-axial, would certainly tend to overturn the structure, but the author omits to qualify the term by which he thus designates superimposed loads. It is true, however, that any misconception that might arise will probably be dissipated on the study of subsequent paragraphs, dealing with the position of the centre of gravity of a scaffolding as affected by a series of loads carried on different parts of the structure.

We are next told that the resultant of the various loads points to the centre of gravity of the entire mass, and that if the vertical line taken from the centre of gravity falls within the base, the scaffold is in equilibrium. This is quite correct, and, as the author adds later, no load of which the centre of gravity, considered separately, falls within the base of the scaffold will cause instability, the most it can do being to bring the centre of gravity of the entire mass nearly to—or, as he doubtless intended to say, vertically above—the boundary of the base, so that a comparatively light load acting from without may cause loss of equilibrium.

With regard to the influence of wind pressure on stability, the author takes it for granted that, as the wind occasionally exerts a pressure of over 50 lb. per square foot, the least pressure for which calculations should be made is 40 lb. per square foot. It may be remarked, however, that the provision recommended by the Board of Trade is 56 lb. per square foot, and that the dynamic effect of sudden gusts has to be considered as well as the static force due to steady wind pressure. Therefore, while it may be safe in most cases to take 40 lb. per square foot as a minimum, prudence suggests the higher limit. The final recommendation of the author to the scaffolder is that "whether the force he is dealing with arises from the wind, loads, or a combination of both, he must triangulate." This is very good advice, but the reader is not instructed in the art of "triangulation," and if this chapter were provided with a few worked examples, considerable assistance would be afforded to those who wish to learn how to apply the lessons there conveyed in general terms. Chapter IX. contains as much useful information on "The Strength of a Scaffold" as can be expected in the brief allowance of less than nine pages of letterpress, but the exposition unfortunately stops short just where the designer begins to feel the want of further explanation. The author discusses the resistance of timbers as beams, struts, and ties, and gives simple rules, together with useful constants for timber of different kinds; but he does not attempt to deal in any way with the design of scaffolding regarded as a framed structure, or to indicate the methods by which the various stresses may be determined and both strength and stiffness adequately ensured.

In the last technical chapter of this work there are some hints which should be found most useful to those who are intrusted with the work of erecting scaffolding so as to provide for the safety of workmen in directions that are not affected by the stability or the strength of the scaffold as an engineering structure. This chapter entitled "The Prevention of Accidents," includes a number of serviceable suggestions, which deserve to be carefully remembered by all who are responsible for the construction of scaffolds or for their after supervision.

Chapter XI., giving a summary of various enactments and by-laws affecting the erection of temporary stagings, and the responsibilities of those who erect them, forms a fitting conclusion to a really valuable little treatise. So far as its scope extends, the book is worthy of general commendation as a reliable guide on a branch of construction which, in the past, has been left too much in the hands of workmen, and correspondingly neglected by architects and others possessing the technical knowledge necessary to insure safety and economy, both of labour and of material.

HOUSING SCHEME, CHISWICK.—Major J. Stewart, an inspector of the Local Government Board, recently held an inquiry at Chiswick Town Hall concerning the application of the Chiswick District Council to borrow a loan of 10,000*l.* for erecting workmen's dwellings in Magnolia-road. The Clerk, Mr. E. F. Collins, said that of the 10,000*l.* applied for, 800*l.* was for the purchase of the land, 700*l.* for the construction of the road and sewer, and the remaining 8,500*l.* was the estimated cost of the buildings. The scheme was for the erection of thirty-four double tenements, each tenement to contain two bedrooms, a living-room, and a scullery. Among those present at the inquiry was Mr. J. Barclay, surveyor.

THE INFLUENCE OF GREEK ART ON THE PERSIAN ORDER.

By Mr. R. Phenè Spiers.

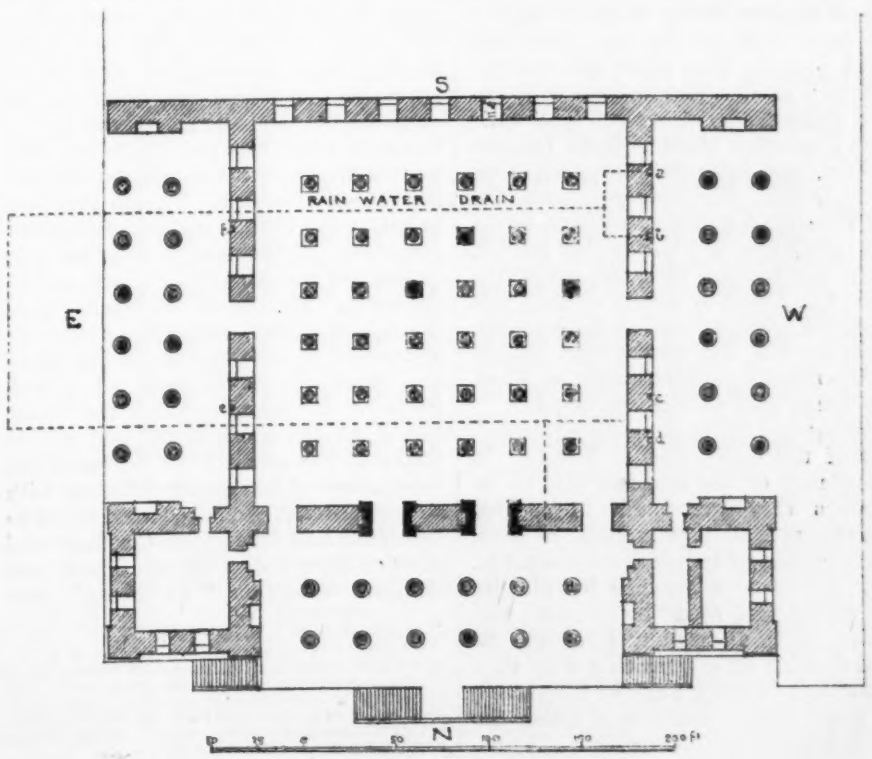
WHEN, in 1851, shortly after Layard's discoveries at Nimroud, Fergusson published his work on the Palaces at Nineveh and Persepolis, and later on reproduced in the Assyrian Court at the Crystal Palace his conjectural restoration of an Assyrian Palace, he copied therein the Persian order as developed in the Great Hall of Xerxes at Persepolis, his assumption being that Xerxes had copied in stone the columns and capitals which in the Assyrian Palaces had been in wood only, and had consequently perished either in course of time or in a conflagration. Layard's subsequent discoveries, followed by those of La Place at Khorsabad, have thrown additional light on the subject, which render Fergusson's theories extremely doubtful. Into this subject we do not propose to enter here, but the unfortunate selection of architectural details made by Fergusson from the palaces built by Xerxes in 485 B.C. on his return from his expedition through Greece and Asia Minor has led the student into the belief that the Greek Ionic order owes the origin of some of its principal features to an Assyrian source, and in his description of Greek Architecture Fergusson refers frequently to this subject.

The object of this essay is to show that, in his development of the Persian order, as found in the Palaces of Persepolis and Susa, Xerxes was indebted to Greek models and possibly to Greek artists, and this task has been rendered easier in late years by the discoveries of archaic Greek work, some of which is nearly two centuries earlier than the work in the Palaces referred to.

It is necessary first to point out that the early work of Cyrus and Darius (restricting our inquiry to the Persian order of columns only) bears no resemblance whatever to any remains found in Assyria, or suggested in the bas-reliefs which have been brought to Europe, or known by drawings made from other examples. If we are able to accept the clear description given by Polybius of the great Palace at Ecbatana, constructed probably by Cyaxares about 620 B.C., and enlarged and restored by the Achæmenian monarchs, it is to the Capital of the Median Monarchy that Persia owed the source of her inspiration. Polybius (X. 24) states that the columns of the stones and peristyles of the Palace at Ecbatana were in cedar and cypress, supporting beams and framed ceilings in the same material, all covered with silver plates, and that the roof was covered with silver tiles. The ephemeral nature of the one material and the intrinsic value of the other are sufficient to account for their entire disappearance, but of the restorations by Darius and Xerxes, who occupied Ecbatana as one of their capital cities, many remains have been found, and the stone columns, bases, and capitals are similar to those found at Persepolis and Susa. If the *stoas* and *peristyles* mentioned by Polybius were halls of columns and porticoes, we are able not only to account for the origin of the Persian order, but for the plans of the palaces at Persepolis and Susa, the only change being that stone columns have been substituted for those which, in the palace built by Cyaxares, were in timber only, the entablature being still in wood, as evidenced by the wide intercolumniation of from 4½ to 5½ diameters.

The earliest Persian palace of which remains exist was that built by Cyrus the first King (560 B.C.) at Pasargadœ, where he defeated and took prisoner Astyages, the last Median monarch. Of this Persian palace there remains *in situ* only one column, unfluted, over 30 ft. high, built in three drums, with a plain circular base, and three stone antæ, 21 ft. high, on the upper portion of which are the sinkings in which the timber architraves were housed. The foundation bases of other columns have been found and portions of the foundations of walls, which showed that the Palace consisted of a central Hall of columns and, at least one portico. The design was evidently of the simplest kind, showing that in its origin the Persian order had none of the elaboration found in the work of Xerxes. The same may be said of the Palace built by Darius at Persepolis in 521 B.C. No columns were found there, but the foundation bases of all those in the central hall and entrance portico were still *in situ*. Only one stone anta remains, in the upper portion of which are the sinkings for the housing of the entablature. In Fig. 1 (see plate) the section represents the actual sinking in the stone, and, taken in conjunction with the tomb of Darius at Istakr, close to Persepolis, is of great value, as it enables us to make a conjectural restoration, at all events, of a portion of the entrance portico, Fig. 2, which would seem to have been copied in the tomb, and was of the same dimensions in width and height. Here we find the oldest example remaining of the Persian capital, which consisted of two bull's heads and half-bodies, forming a bracket capital to support the architrave, and carrying on their backs *a corbel which projected in front of the column so as to carry a projecting architrave*, Fig. 1. Such a feature actually exists in the tomb façade and the sinking in the anta proves its existence in the portico of the Palace. In order to balance the weight, we have suggested a similar feature at the back, so that the Persian capital was a quadruple bracket capital, which neither Coste, Dieulafoy nor Perrot and Chipiez seem able to realise. In the tomb the columns carved are only semi-attached, so that the bracket in the rear does not occur. The columns carved in the tomb are unfluted, and their bases consisted of a plain torus moulding on a square die. The front view of the bull-headed capital is shown in Fig. 5. The only other early example of a base is that found by M. Dieulafoy at Susa, with the name of Darius inscribed on it (Fig. 4). This base is known as the campaniform base, and its origin, as also that of the bracket capital, is suggested in Fig. 3, which represents a portion of a projecting porch or shed in front of a peasant's house, as found down to the present day. The oblong block had for its object a better support for the architrave beam than that given by the post alone, and to preserve from damp the lower portion of the post, it is usually raised on a base consisting of rubble stones coated with mud. As both these features, viz., the bracket capital and the campaniform base, are peculiar to the Persian order, and are not found in any other known style, we are inclined to assign to them a Median origin.

The intercolumniation of the columns carved on the tomb of Darius is 4½ diameters (5½ centre to centre) and the relative proportion of height is 10½ diameters, which suggests that the superstructure was in wood, and, as shown in the tomb of Darius and in the anta of his



Plan of Great Hall of Xerxes, Persepolis.

C

palace, consisted of squared beams projecting slightly one in front of the other. Beyond that, as all the timber work has perished, we have no further evidence, and our description of the development of the order under Xerxes is confined to the columns.

Before entering into this question a few words on the Great Hall of Columns built by that monarch at Persepolis, may not be out of place, especially as there exist some wide divergencies of opinion with respect to its conjectural restoration. If we have ventured to dispute the correctness of Fergusson's theories respecting the restoration of an Assyrian palace, there is no doubt that in his conception of the plan of the Hall of Xerxes, as set forth in his work already referred to, he followed the only interpretation possible, and his statement "that some restorations he had seen were too absurd even to merit exposure" has been borne out by later discoveries. Fergusson contended that (A) the Central Hall of Columns was inclosed with a wall (see plan in wood-cut); (B) the stone pedestals (shown in black on plan) were the plinths of entrance doorways in this inclosure wall; (C) there were anta to all the three porticoes; and (D) the angles of the main front were occupied by square halls containing wood staircases leading probably to the roof.

Fergusson's theory was based on the existing plans of other palaces at Persepolis and on that at Susa. These palaces being, first, the Palace of Darius, already referred to; second, a palace inscribed with the name of Xerxes; third, the Palace of the Hundred Columns; and, fourth, the Palace at Susa. In the first two named there still remain the stone foundations of the square chambers or halls at the angles, and in all these cases the central hall of columns was surrounded by a wall. In the Palace of Darius, in addition to the features already named, there exist at the back of the portico the great doorway leading to the central hall and two windows on each side. These features were all in great blocks of stone; one for each jamb and one for the lintel and carved cornice, with stone sills for the windows; similar features exist in the other palaces at Persepolis. The walls which connected these isolated features are gone, and from the projecting stone bossing in their sides it is conjectured that they were built either in unburnt bricks or in rubble masonry laid in clay mortar, which was bonded with the projecting bosses,* and that in course of time this ephemeral construction has disappeared. This is the case with all the other palaces and the stone foundations only on which these burnt bricks rested are found.

Coming now to the conjectural restorations of the Great Hall of Xerxes. In consequence of the immense size of its doorways they were built in coursed masonry, and all that remains of them are the plinths of two of them about 4 ft. high. These were assumed by Flandin and Coste, followed by Perrot and Chipiez, to be altars, but it should be noted that on three sides only were they worked to a fine face; on the fourth side (see plan) is that recess into which the wall was bonded.

* In nearly every other case instead of the projecting bosses there are sinkings or recesses into which the brickwork was bonded.

On the platform of the Great Hall Flandin and Coste found a number of vertical stone drains, which they assumed were intended to drain the surface of the platform, and they indicated on their plan the connexion of these, one with the other, by a horizontal drain running under what would have been the site of the east and west inclosure walls of the great wall.* Further, they stated that on the south side of the southern row of columns of the great hall and in the angles of the north front the natural rock existed everywhere and bore no trace of having carried a wall. Based on these assumptions, Flandin and Coste, followed by Perrot and Chipiez, contended that, firstly, there could have been no inclosure wall to the central hall, as no one would erect a wall of crude brick on a site below which ran a great drain; and, secondly, there was no evidence of a superstructure on the natural rock of the south side. They assumed the doorway plinths in the north inclosure wall to be altars, and put forward a conjectural restoration of the Great Hall consisting of four groups of columns only; a centre group of thirty-six columns in six rows of six each, and north, east, and west groups of twelve columns each, arranged in two rows of six each, all of these groups standing isolated one from the other on the raised platform of the Great Hall.

In 1891 Mr. Weld Blundell went out on a mission at the instance of, and partly at the cost of Lord Savile and Mr. Cecil Smith to take casts of some of the sculptured bas-reliefs at Persepolis, and the author of this essay furnished him with a plan of the site and directed his attention to some of the points at issue. Mr. Weld Blundell ascertained, firstly, that of the vertical stone drains, the remains of one of them (*a* on plan) rose 15 in. above the pavement of the hall and must, therefore, have been carried up in the wall to drain the roof; secondly, that these drains† were not at their feet connected one with the other, but that each one at its foot was diverted into other drains running between the first and second row of columns (see plan); thirdly, that the natural rock as it appeared to Flandin and Coste on the south side of the hall and on each side of the main front, was one which had been formed in the course of time by nature; the fine clay moistened by rain had been baked by the blazing sun to the apparent consistency of the natural rock, and was as fine and smooth as that which existed elsewhere; Mr. Weld Blundell broke through this crust, and on the south side of the hall found about six inches below this crust the foundations of a wall 11 ft. 8 in. thick running the whole length of the south front, and at the angles of the north front he found the foundations of the corner chambers with an accumulation of charred wood which he concluded had fallen from the floors and roofs of these halls. Messrs. Perrot and Chipiez's work on "La Perse" were published before 1891, and they were therefore not aware of these discoveries, which throw an entirely new light on the actual plan of the Great Hall, though Fergusson contended from the first that Coste must have been mistaken in his conjectures and in the plan he showed of the drains. These subterranean drains were entered by Mr. Weld Blundell; they were partly cut in the solid rock and partly hewn out of immense blocks of stone; they measured from 2 ft. 3 in. to 2 ft. 8 in. wide, and in some parts were 8 to 10 ft. high. They crossed the palace in two lines, and were connected with other drains leading to the outside of the great acropolis platform. The vertical stone conduits were cut in solid blocks of stone, the apertures of the gullies being 1 ft. 3 in. square.

The principal development in the Persian column as set forth in the palaces built by Xerxes at Persepolis and Susa was in the variety of design given to the campaniform basis, the fluting of all the columns and the additional decorative features of the upper part of the shaft under the bracket-capitals, not found in any earlier examples. In these we seem to recognise a new influence, which we attribute to the result of his expedition through Greece and Asia Minor; to the art treasures which he took back with him, and possibly to the Greek artists whom he is said to have brought over from Miletus and Eretria. The execution of the carving is so much more refined than that which exists in earlier examples that we are inclined to the belief it was carried out by Greek artists;* they must, however, have worked under the direction of Xerxes or his art director, otherwise it is difficult to understand the strange jumble of various decorative forms which are employed in the carving of the upper part of the shafts under the bracket-capital (Figs. 5, 6, 7, and 8.) If we assume that the first essay was made in his Great Hall at Persepolis, the result would seem to have been quite satisfactory to him and to his successors, as it was employed in all palaces subsequently built in Persepolis, Susa, Istakr, and Ecbatana without any material change in design. The columns of the East and West Porticoes of the Great Palace were not decorated in this way, and the only difference shown there is in the substitution of lion's heads and half bodies in the bracket-capital of the East Portico. These columns are nearly 13 diameters high, and, with the forty-eight flutes to their shafts from top to bottom, which seems to increase their height, have an extremely attenuated appearance (woodcut 2). Moreover the junction of the shaft with the bracket-capital is ungainly, so that it is quite possible this may have called for the further enrichments which were subsequently given to all columns whatever their dimensions might be. The columns at Istakr, 25 ft. high, are only smaller copies of the great columns at Persepolis, which are 68 ft. 9 in. high. The enrichments are three in number, separated one from the other by the bead and reel string, a favourite Greek ornament found in nearly all

* Fergusson in his work already referred to, p. 147, says "these gentlemen" (Flandin and Coste) "make the drains proceed from one to the other; and though it may appear impertinent in one who has never been there to say so to those who have, my own impression is that this junction does not exist." As will be seen later on, Fergusson's statement was correct.

† Mr. Blundell found six gullies, marked *a* to *f* on plan; he described *a* and *b*, and traced their connexion with the others shown. The other vertical drains were filled up with silt.

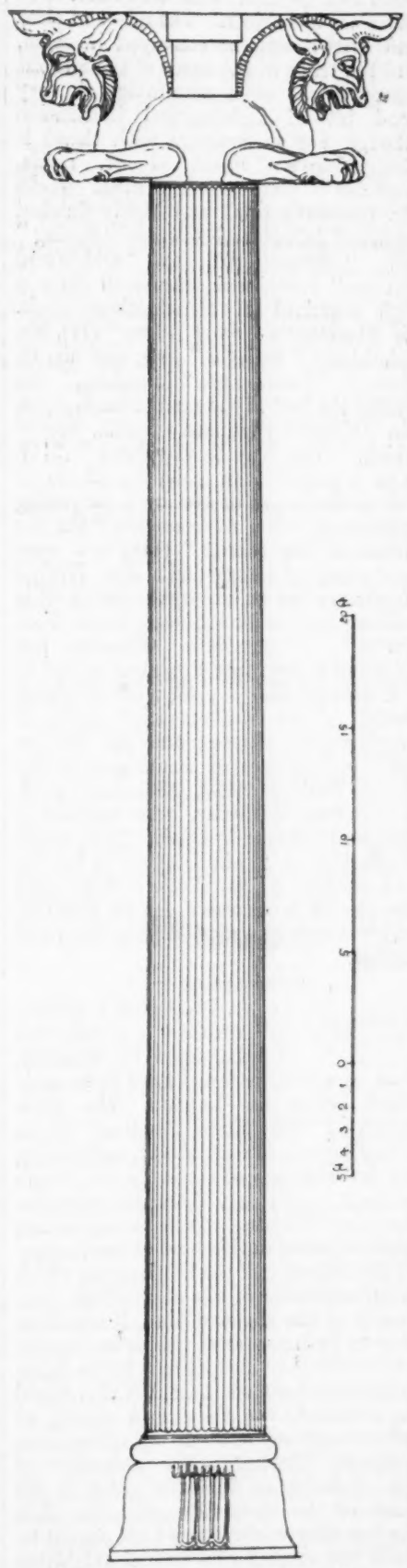
* According to Mr. Cecil Smith, the mason's marks on the upper surfaces of the bases (now exposed) of the Hall of the Hundred Columns are characters from the Greek alphabet.

archaic Ionic capitals, the earliest known existing example being those at Ephesus (Figs. 18 and 20) and Naukratis (Fig. 21), both B.C. 560. The upper enrichment (Fig. 5) consists of four Ionic volutes placed vertically with supplemental volutes at the top and bottom. They mask to some extent the junction with the bracket-capital. If Xerxes took back with him some of the archaic capitals from the Temple of Miletus, which he destroyed, they may have suggested the feature. In these early Ionic capitals the abacus is generally twice as wide as its depth; they are in fact bracket-capitals, but the Persians already possessed their own type, which they preferred, so they utilised the feature in another way. Fig. 7 shows the half plan and Fig. 5 the decoration of what was the under surface of a Greek volute-block with the fillets of the cushion carried down vertically. The extra volutes may have been suggested by some Assyrian capitals, or were added to increase the height of the feature.

The middle enrichment at first sight resembles the well-known Egyptian palm tree capital, except that the leaves of the same are always indicated in the Egyptian example by incised lines each side of the stem; here under each lobe is a bud, which may be that of the papyrus plant, so that they represent the flower of same, and may have been copied from an Egyptian ivory brought from Egypt by Cambyses, just as the windows with balconies supported by shaft balusters shown in Assyrian bas-reliefs were copied from the ivories found at Nimroud by Layard and now in the British Museum. The lowest enrichment reproduces the pendant petals of a flower, of which the complete form is shown in a capital found at Delphi by Professor Cockerell (not probably of very early date, but indicating the original *motif* from which the egg and tongue decoration in the Ionic volute was derived). The earliest existing example is that found at Naukratis, now in the British Museum (Fig. 14). In the capital of the Votive Column at Delphi (Fig. 15) the divisions between the petals are merged into the fluting of the shaft. In the Athens capital (Fig. 16) the petals are painted only. In the terra-cotta capital from Gela (Fig. 17) the petals are almost as long proportionately as those in the Persian capital. The examples from the archaic temple at Ephesus (Figs. 18, 19, and 20) still suggest the origin of the egg and tongue (the upper part is at back), and one of the capitals (Fig. 20) has its volutes decorated with a flower similar to that found in the capital from Susa (Fig. 9).

Coming now to the shaft, the earliest examples of fluting are those found in the works of Xerxes. The number of flutes varies according to the size of the column; at Istakr, already referred to, there are only thirty flutes. The number in the other palaces at Persepolis varies from forty to fifty-two. The flutes in the early Greek examples vary in number; in the earliest examples at Ephesus, 560 B.C., there are fifty-two. There are no fillets in the Persian examples, as shown in Texier, but Dieulafoy's photogravure shows that some of the edges have worn away, which may have led Texier to the belief that he recognised fillets: To direct Greek influence therefore we may attribute the Persian fluting of the shafts.

If in the capital and enrichments below the same no change would seem to have been made, the bases show considerable



Column, Hall of Xerxes, Persepolis (Capital of East Portico: Base of West Portico).

variety, of which in Figs. 10, 11, and 12, we give some of the more characteristic examples, and these compared with various selections from Greek work suggest the source from which some of the designs may have been derived. We have already referred to the pendant petals; there is another peculiar form to which the French give the name of *rais de cœur*, shown in the cornice of the archaic stem from Ephesus (Fig. 22) and in the capitals from Ægæ (Fig. 23) and Neandria (Fig. 24), which are embodied in Fig. 11. Fig. 12 would seem to be based on an Egyptian design as regards its upper portion, in which the globe between papyrus or lotus buds is carved.

When compared with the primitive base of Darius (Fig. 4), the various combinations of design and their similarity to well-known decorative features throughout Ionia, some of which predate the work by Xerxes by nearly two centuries, constitute a strong argument in favour of the influence of Greek art upon that in Persia.

In conclusion we would express the hope that in course of time it may be possible to find a room in the British Museum where casts of the more remarkable examples of Persian work may be exhibited. Their connection with Greek art is much closer than that which can be traced in the examples of Indian architecture which encumber the staircase in the British Museum and which might with greater advantage have been left with the Indian collection at South Kensington.

NOTES.

The Institute Council Election.

THE voting for the election of the Council of the Institute has, there is every reason to believe, been carried on by many members with a view to keeping out those who are opposed to the movement in favour of registration. The result is that Mr. G. F. Bodley, Mr. J. J. Burnet, Mr. Mountford, Professor Pite, Mr. G. H. Fellowes Prynne, and Mr. Paul Waterhouse, some of the very best names in the list put up for election, are turned out. This, we suppose, is by way of raising the standard of the Profession and of the Institute.

A Modern Telephone Exchange.

WE had an opportunity this week of inspecting the new exchange of the National Telephone Company in the Birkbeck Building, Holborn. In accordance with the best modern practice, the central battery system has been adopted. The thousands of small hand generators and batteries have been replaced by a battery of accumulators and a motor-generator at the exchange. The voltage used is only 24, so there will be no fear of shocks. In the operating-room the system of visual signalling is exclusively used. The candle-power of the lamps, which are covered by an opal glass cap of the size of a threepenny bit, is very low, so that there is no strain on the eyes the girl operators, but they are sufficiently bright to give a very conspicuous signal. When a subscriber takes his telephone off the rest his lamp signal on the exchange switchboard glows, and on learning the desired number the operator inserts a plug, technically called a "jack," into the proper switch, and this automatically extinguishes both the miniature lamp and a pilot-lamp over the switchboard, which notifies the supervisor should a call

remain unanswered. When the subscribers replace their telephones in the rests, both miniature lamps light up, and this is the signal for the operator to remove the jack. Provision has been made to prevent accidents due to telephone circuits getting into contact with lighting systems or the trolley wires used in electric traction. Fuses have been inserted in the catch of a spring. The moment the telephone wire makes contact with a "live" wire the fuse melts, cutting out the telephone wire and ringing a bell. A simple but effective form of lightning protector has also been adopted. The system adopted of testing for faults by means of banks of lamps suitably arranged enables them to be located immediately. We understand that the National Telephone Company are gradually adapting all their fifty-seven London exchanges to the central battery system. We were favourably impressed with the care taken by the Company for the comfort and the equitable treatment of the 100 operators in this exchange. Everything is done to secure equal distribution of labour. An indicator in the operating-room registers the number of calls every operator receives. This is examined every thirty minutes, and if one operator is found to be too busy a number of her calls are connected to a less busy operator. Suitable reading and dining rooms are provided for the employees.

Holy Trinity Church, Gough-square, E.C.

THE BISHOP OF LONDON will shortly appoint a commission, under the provisions of the Union of Benefices Act, 1860, to inquire into the expediency of uniting the vicarages of St. Bride, Fleet-street, with Bridewell, and Holy Trinity, Gough-square. The latter church then, it seems, is marked for demolition. It was erected in 1837-8 after plans and designs by John Shaw the younger, as a district church, to contain 1,100 seats, in the parish of St. Bride. The structure stands upon a triangular site given by the Goldsmiths' Company, who own a considerable amount of property in that locality, at the junction of Pemberton-row and Great New-street, to the west of Gough-square, Fleet-street. The plan is that of a hexagon, 47½ ft. in diameter, with two octagonal recesses on the north-east and south-east sides for pews, and a larger similar recess which forms the chancel. The interior was almost wholly surrounded by two galleries carried upon iron columns. The glass in the three chancel windows is by Willement. Sir Arthur Blomfield rearranged the interior in 1873, and it was redecorated three years afterwards. The church, which is faced with yellow brick, is designed after the Norman style, or what was supposed to be so at the time. The architectural treatment is exceeding naïve, regarded from our present standpoint; but the plan, as a means of suiting the church to the outline of the site, has merit and originality. The building was erected by Howard and Nixon at a cost of 3,887*l.*

Dudley Gallery Art Society.

THE fortieth exhibition of water-colours organised by the Dudley Gallery Art Society is one of their best. Four works which stand quite apart are the four admirable views of ancient Roman remains and their surroundings by Signor Giampietri, especially the two of the "Temple of Saturn" (Nos. 42 and 283). These drawings stand out from everything else for power and force of effect, and represent the perfection of what can be done with water-colour in this class of subject. The effect of clear and bright sunlight conveyed in them, and the truth of the tones of the ancient masonry, are alike admirable. A very good bit of architectural illustration (though not to compare with these) is Mrs. Moon's "Porch of St. Denis, Amboise" (76). Among other works Mr. Duassut's small and highly finished scenes of foliage and flowers—"Spring" (22), "Phlox" (29), an "Old-World Garden" (110), and others, all show a high standard of conscientious work. Mr. Stormont's "Sand Dunes" (74), Mr. Coleridge's "Bellagio" (64), and Mr. G. Marks's "Landscape, Shropshire," are among the best of the smaller landscapes. Mr. Sylvester Stannard's works, one of which, "The Way to the Farm" (214), is on a rather large scale, are all clever but spoiled more or less by a pervading mannerism. Mr. A. Stevens's "On the Rocks at Cap Martin" (116) is a very good study of foreground; Mrs. Evelyn Heathcote has an admirable sketch (it is nothing more) of a "Stream in the New Forest" (132); Miss Gilchrist has achieved a good free treatment of sea in "A Stormy Tide" (142); Mr. Burleigh Bruhl's "At Walberswick" (169) is another good sketch; and Mr. Wilkinson's two studies of Drummers of the Royal Fusiliers (129, 186) are good. Mr. Forbes Witherby, who exhibits a sketch of "Rome at Dusk" (109) which is effective as a whole, spoils it by the bad outline of St. Peter's dome (we presume it is intended for St. Peter's), which is totally wrong in proportion and outline.

Whistler's Lithographs.

AT Mr. Dunthorne's Gallery in Vigo-street is a collection of lithographs by Whistler, most of which we fancy have been exhibited before in London. The little sketch of "The Model Reading," which is well known, is very pretty, and among the few sketches of single figures, rough as they mostly are, there are examples that show Whistler's facile though rather careless power in this kind of production. Of the majority of the lithographs, which include sketches of bits of buildings, etc., mostly of the slightest kind, it would be easy to find a score of people in London who could not only produce better lithograph sketches than these, but who would be ashamed, for their own credit, of exhibiting many of them. Nothing more pointedly illustrates the absurdity of the adulation of Whistler which is the mark of the up-to-date art-critic, than the fact that work of this kind should be made the subject of a special exhibition and talked of as if it were something wonderful.

The Dutch Gallery.

AT the Dutch Gallery in Brook-street Mr. Van Wisselingh has got together a small collection of oil paintings by French, English and Dutch painters. Among them are a charming little bright sketch by M. Fantin-Latour, "Ondine" (2), and a fine work by W. Maris, "Cattle Under the Willows" (19). Mr. Conder's two pictures of Brighton, especially the "Stormy Day" (5), have a great deal of individuality of style and treatment. There is something that reminds one of the figure-composition of Blake (on a larger scale) in Mr. C. H. Shannon's "The Bathers" (12), a picture in which there seems to be an attempt to put a certain degree of poetic sentiment other than the title would at first suggest. In his other picture, "The Toilet Scene" (13), the figure on the right seems out of proportion and remarkably long in the torso. There are other works of interest, and some which are rather curious than beautiful, in which category we should place the two by Monticelli, a painter who, as an artist once remarked to us, tried to paint pictures to look like carpets. This also (like the Whistler etchings) is a form of *caviare* to be swallowed by those who would be of the new orthodoxy in art. To our thinking it is merely a form of pictorial perversity.

Sketches in the Balearic Islands and Venice.

AT Messrs. Dickinson's Gallery in Bond-street is a collection of small water-colour sketches in the Balearic Isles and Venice, by Mr. Douglas Fox-Pitt, which, though slight, have the merit of showing a decided feeling for colour and atmosphere. "A Street in Palma" (20), "Mr. Eden's Garden, Venice" (22), "Venice" (23), an out-of-the-way corner, are all good examples of free rendering of light and colour. "The Windmills, Palma" (48) is a record of a curious bit of effect; and "Cloisters of S. Francisco, Palma" (42) a good sketch of an interesting bit of architecture.

THE EXHIBITION OF ANCIENT SIENESE ART AT SIENA.

I SHALL not attempt in the following notes to give an exhaustive description of this exhibition, nor to criticise it from the artistic point of view; but the importance of many of the objects exhibited, and the fact that until quite recently no official catalogue was to be had,* may serve as apology for the following short account of it, which may be of use especially to intending visitors, as an indication of what they may expect to find there. The exhibition is advertised to remain open until the end of August, but the time may eventually be extended.

The locale could not have been better chosen. The first and second floors of the splendid Palazzo Pubblico provide ample space, and the frescoes which decorate the walls of many of the rooms form a fitting background.

The objects which have been collected belong to a considerable extent (and this is especially the case in regard to the pictures) to the churches of Siena and its environs,† though some places at a greater distance—Orvieto, Grosseto, Massa Marittima—have added their contributions; and a good deal comes from private collections. In any case, it is an excellent opportunity of comparing works of art that have not been brought together before—though it would have been easy to arrange works by the same artist in juxtaposition to a greater extent than has actually been done—and of seeing under favourable conditions pictures that are often badly placed in the churches to which they belong.

The exhibition is divided into forty sections, each in a room to itself. The first of these

* At the time of my visit (May 17) it was expected to appear in a few days; but in the meanwhile only a short guide was available.

† The pictures from the Accademia and the Opera del Duomo have not been removed, though several of the treasures of the latter are on view here, including the sculptures of the Fonte Gaia and a few others.

contains pictures, plans, drawings, and engravings which illustrate the topography of Siena from the XVIth century onwards. The second, which occupies the Sala della Pace, with the famous frescoes of Ambrogio Lorenzetti on its walls, contains the smaller specimens of goldsmiths' and silversmiths' work from the XIIIth century onwards, the greater part of it consisting of church plate, monstrances, crucifixes, etc. The third, in the Sala del Gran Consiglio, is a fine collection of embroideries from the XIVth century onwards, the great majority of which are ecclesiastical vestments from the various churches of Siena and the neighbourhood. Some fine *paliotti*, or altar fronts, are to be found in various other rooms.

The larger specimens of the goldsmith's art are housed there and in the chapel of the Palace (sections 4 and 5). They include a fine and very elaborate reliquary by Gabriello di Antonio di Lorenzo da Siena (1350-1411) from Lucignano, a fine XVth century head of a processional cross decorated with coloured enamel from the same place, the splendid reliquary which contains the head of S. Galgano from his church in Siena, two or three works by Francesco d'Antonio, including the box which serves to contain the arm of St. John the Baptist in the Cathedral, and the magnificent tabernacle by Ugolino di Vieri from the Cathedral of Orvieto.

The seventh room contains cases of illuminated MSS. from the XIIth century onwards, many of which come from the Biblioteca Comunale and the Archivio di Stato, including a XIIth century MS. of S. Augustine's *De Civitate Dei*, another of Pope Pius II.'s *Historia Bohemica*, the codex formed by the Libro dei Censi and Memoriale delle Offese of the Commune of Siena (the book of tributes and the register of "injuries suffered by the commonwealth at the hands of her neighbours"*). There are also many mass-books, four fine XVth century specimens being lent by the authorities of the Cathedral of Chiusi, and others by the Biblioteca Comunale and the Hospital of Siena. Those belonging to the Cathedral library have, on the other hand, been left there.

Room 8 contains a few more similar treasures—among them some books of the Hospital with painted covers, one of which shows the Cathedral as it was before the nave was lengthened—and, with room 9, a collection of statues in wood by Jacopo della Quercia and others, most of them painted or gilded.

Room 10, containing modern frescoes, has been left as it was; room 11 contains a few good specimens of mediæval ironwork, including a very fine hanging lamp; 12 has some good utensils—vases, bells, candlesticks, etc.—in metal, while sections 13 and 14 consist of a collection of arms and armour, and rooms 15 to 18 of casts of mediæval sculptures.

In the loggia on the second floor of the palace (section 19) the fragments of the original Fonte Gaia of Jacopo della Quercia have been re-erected (they were so much damaged that the fountain itself was reconstructed in 1868). The magnificent view forms perhaps an even greater attraction. From here we enter the ceramic collection (rooms 20-22), which has no treasures like the *maidica* of Gubbio and Urbino to show, but contains fine sets of *vasi da farmacia*.

The rest of the exhibition is mainly devoted to paintings and drawings of the Sienese school, and will interest the visitor more or less in proportion to his admiration of its works, the merits and demerits of which have always formed a subject of considerable discussion. Though no new rival to, for instance, Duccio's famous "Maestà" has come to light, it is a good representative collection, so that there is, at any rate, as has been said, an opportunity of confirming or correcting one's judgments upon the subject that should not be missed, as it will be difficult to have the chance again of seeing in the same gallery so many pictures from various places, many of which are not easily accessible.

A certain amount of unnecessary anachronism in the arrangement has occurred. Thus in room 23 we find No. 1,514 (a Pacchiarotto from S. Pietro e S. Paolo at Buonconvento) placed between two pictures by Bartolo di Fredi from the Municipio of Montalcino, which are a century earlier in date.

The collection of mediæval furniture—carved and inlaid work—(sections 6, 32) is surprisingly poor in quantity.

In conclusion, the exhibition, though one may have been led to expect a little too much, is distinctly worth seeing—if only as an excuse for revisiting a place so attractive as Siena. Any slight feelings of dissatisfaction will soon be dispelled by the sight of the Torre del Mangia rising into a glorious blue sky, or by a walk through the town which (though this has been said of many other cities of Italy) has perhaps the most of all preserved for us the feeling of the Middle Ages.

THOMAS ASHBY, JUN.

* Heywood and Olcott, *Guide to Siena*, 29n.

THE ROYAL INSTITUTE OF BRITISH ARCHITECTS.

A SPECIAL general meeting of this Institute was held at the Rooms, No. 9, Conduit-street, W., on Monday evening, Mr. Aston Webb, R.A., the President, in the chair.

Alteration of By-law.

On the motion of the Chairman, it was agreed that the following words be added at the end of the first clause of By-law 3:—"After December 31, 1906, every person desiring to be admitted a Fellow shall be required to have passed the examination or examinations justifying him as an Associate, or shall be elected from the ranks of the Associates. But in special cases the Council by the votes of three-fourths of such members of the Council as are present and voting at a meeting of the Council, shall have power to dispense with such examination or examinations."

The fifteenth general meeting of the Session was afterwards held, when the minutes of the previous meeting were adopted.

The New Council.

A report was received from the scrutineers appointed to direct the election of the Council, Standing Committees, etc., for the year 1904-5. The following were elected members of the Council:—

As President: Mr. John Belcher, A.R.A. As Vice-Presidents: Messrs. T. E. Collcutt, A. Darbyshire, F.S.A. (Manchester), H. T. Hare, S. Perkins Pick (Leicester). As Honorary Secretary: Mr. Alex. Graham, F.S.A. As Members of Council: Messrs. W. H. Atkin Berry, A. C. Blomfield, M.A.Cantab., A. W. S. Cross, M.A.Cantab., F. R. Farrow, William Flockhart, Ernest George, J. S. Gibson, George Hubbard, F.S.A., C. E. Mallows, J. Douglass Mathews, S. B. Russell, W. Gillbee Scott, W. Howard Seth-Smith, J. W. Simpson, John Slater, B.A.Lond., Lewis Solomon, Butler Wilson (Leeds), and Ed. Woodthorpe, M.A.Oxon. As Associate Members of Council: Messrs. R. S. Balfour, W. H. Bidlake, M.A.Cantab. (Birmingham), H. V. Lanchester, Edmund Wimperis. Representatives of Allied Societies: Messrs. G. C. Ashlin, R.H.A., Royal Inst. of the Architects of Ireland; J. W. Beaumont, Manchester Society of Architects; A. W. Brewill, Nottingham Architectural Society; G. Bertram Bulmer, Leeds and Yorks Architectural Society; T. Cooper, Birmingham Architectural Association; H. Davis, York Architectural Society; H. L. Goddard, M.A.Oxon, Leicester and Leicestershire Society of Architects; John Keppie, Glasgow Institute of Architects; G. H. Oatley, Bristol Society of Architects. Representative of the Architectural Association (London): Mr. E. Guy Dawber.

Standing Committees.

The Standing Committees were elected as follows:—

Art Standing Committee.—Fellows: Messrs. J. Macvicar Anderson, W. D. Caröe, M.A., T. E. Collcutt, E. G. Dawber, Sir W. Emerson, Ernest George, J. S. Gibson, H. T. Hare, E. W. Mountford, and A. E. Street, M.A. As Associates: Messrs. R. S. Balfour, S. K. Greenslade, W. H. Romaine-Walker, Henry Tanner, jun., R. Watson, and E. Wimperis.

Literature Standing Committee.—Fellows: Messrs. John Bilson, F.S.A., A. W. S. Cross, M.A.Cantab., C. E. Mallows, W. A. Pite, Professor F. M. Simpson, R. Phenè Spiers, F.S.A., H. Stannus, H. H. Statham, C. Harrison Townsend, and P. Waterhouse, M.A.Oxon. Associates: Messrs. A. S. Flower, M.A.Oxon, F.S.A., C. H. Reilly, M.A., Professor R. E. Smith, P. L. Waterhouse, M.A., A. M. Watson, B.A., and P. S. Worthington, M.A.

Practice Standing Committee.—Fellows: Messrs. T. Batterbury, W. H. A. Berry, G. Hubbard, F.S.A., A. H. Kersey, J. Douglass Mathews, W. Hilton Nash, A. Saxon Snell, T. H. Watson, W. H. White, and E. Woodthorpe, M.A.Oxon. As Associates: Messrs. C. H. Brodie, Max Clarke, E. Greenop, H. H. Langston, T. E. Pryce, and A. W. Tanner.

Science Standing Committee.—Fellows: Messrs. T. Blashill, E. Flint, A. J. Gale, F. Hammond, F. Hooper, G. Hornblower, W. E. Riley, H. D. Searles-Wood, A. Saxon Snell, and Lewis Solomon. As Associates: Messrs. H. W. Burrows, Max Clarke, B. J. Dicksee, E. R. Hewitt, G. Pearson, and A. D. Watson.

The following gentlemen were then elected to the Institute:—

As Fellows: Messrs. Thomas Arnold (Edinburgh), Walter Albert Catlow (Leicester), Max Clarke (London), Allan Ovenden Collard (London), Wm. Henderson Duncan (Rochdale), Edward Goldie (London), Alfred Hy. Hart (London), Charles Grove Johnson (Mexico), Wm. Campbell Jones (London), Wm. Alfred Large (Ealing), Thos. Ed. Marshall (Harrogate), John Campbell Turner Murray (London), John Hy. Phillips (Cardiff), Alfred Roberts (Greenwich), Wm. Rushworth (Croydon), Percy Burnell Tubbs (London), John Collingwood Tully (Cape Town), Benjamin Woollard (London).

As Associates: Messrs. C. Rosenthall (Sydney, N.S.W.), and H. E. Hall (London).

Hon. Associates: Lord Stanley of Alderley and Mr. J. J. Shannon (London).

Hon. Fellow: Lord Curzon of Kedleston.

The Plenum System of Ventilation.

The meeting then discussed a paper by Mr. William Henman—"Notes on the Plenum System of Ventilation," which was taken as read, but of which the following is the text:—

'In the paper which I read last December* on the Royal Victoria Hospital, Belfast, I particularly stated it was not my desire to raise controversy on the subject of mechanical *versus* natural means for securing ventilation; yet, as members then present expressed the opinion that it might with advantage be further discussed, the Council of the Institute have appointed June 6 for that purpose. If the time then at our disposal is to be well employed, the subject of ventilation generally must be dealt with on practical and scientific lines; and as that was not attempted in the paper to which I have referred I venture to suggest some reasons which tend to show that plenum ventilation can be beneficially employed in certain buildings, and ought to be more closely studied by members of the architectural profession.

A primary necessity is to arrive at a concisely correct definition of what should be understood by the term "efficient ventilation" when applied to occupied buildings. Apart from outside contaminating influences which would affect ventilation by whatever means obtained, I suggest it is "continuous change of air within a building without causing discomfort or adversely affecting the health of the occupants."

The province of an architect in connexion therewith is to dispose buildings on the ground, construct and equip them, so that the available air may be supplied in ample quantities, freed from suspended impurities, tempered and regulated to requirements without deterioration.

Buildings are erected principally to secure greater comfort than can at all times be obtained in the open.

By the erection of buildings, movement of air within them is necessarily less than it would be over the unoccupied site.

Change of air within a building is principally brought about by an ascertainable force—either of propulsion or extraction—although the law of diffusion—*i.e.*, the process which brings about intimate mixture of gases without chemical combination—is a serviceable but less powerful agent in connexion with ventilation.

If these premises be accepted, the question which has to be discussed is not whether by plenum ventilation a condition within doors can be secured equal to the open air at its best, but whether it can be employed in certain buildings, suitably constructed, so as to obtain at reasonable cost more constant and efficient ventilation than can be secured by other means.

A great hindrance to the proper comprehension of this subject is the employment of unscientific terms, such as "artificial ventilation," "automatic ventilation," "natural ventilation," "mechanical ventilation," because they prejudice the mind. Ventilation is a result brought about either by natural *or* by mechanical force. Moved by either, air is the same, just as water is the same, whether allowed to flow naturally or forced on by mechanism. Water may become fouled on its way, so may air, whether it pass in naturally or is propelled

* See our issue for December 19, 1903.

in its course from the outside to the inside of a building; but it does not in the least follow that fouling results from the power which caused its movement.

It is scientifically wrong to refer to a fire causing a "suctional" influence in a flue, for it does nothing of the kind.

Air when heated expands and is specifically lighter than an equal volume of colder air; it is the latter descending by the force of gravitation which propels the warmer air upwards; consequently an open fire in a room causes change of air by propulsion; moreover, the propelling force of wind is far greater than the suctional influence it exerts upon air within buildings. By realising these facts it is easy to understand that "plenum" ventilation is more in accord with nature's methods than "exhaust" ventilation.

Notwithstanding the acknowledged extravagance of, the dust and dirt resulting from, and the unpleasant draughts at times set up by, the open fire, I for one appreciate its cheerfulness, and believe it will long hold an honoured place in the British home. The mere fact that it necessitates an upcast flue is of the greatest service in connexion with ventilation; but as the area of an ordinary smoke flue at the chimney-pot end does not greatly exceed half a superficial foot, the volume of air which can pass through it in a given time is limited, as is also the heating power of a single fire-grate. Consequently, for larger apartments two or more fires are required, and it is well known that, unless an adequate supply of air be otherwise provided, smoke will at times be drawn down one or other of the flues. For this and other reasons hot water, steam, air heated by stoves or electricity, are used, none of which demand an upcast flue or flues from the apartment to be warmed thereby. Yet for the health and comfort of occupants change of air is a necessity, and can only be brought about by providing suitable inlets and outlets. This is a simple statement of fact of the utmost importance in connexion with ventilation, yet too often neglected, resulting, doubtless, from difficulty in determining the positions, dimensions, and construction of such openings, and I incline to the belief that strong advocates of what they term "natural ventilation" are of the *laissez faire* order who expect nature to do everything for them; and as they do not consider whence the wind cometh nor whither it goeth, they provide neither suitable entry nor exit for it in the construction of buildings.

With regard to the possibilities and difficulties of ventilating an apartment warmed by other means than open fires, say a church or assembly room. Suppose it is a calm, frosty day, with the temperature inside several degrees higher than it is outside. If inlet-openings are provided at or near the floor level and outlets at or near the ceiling level, a steady flow of air will take place from the inlets to the outlets proportionate to the difference between the internal and external temperature, and to the relative sizes and positions of the openings, brought about simply by the propelling force of the colder air outside falling by gravitation; but it does not follow that ventilation will be "efficient" even if the openings are adequate and well placed, because the differences in temperature may not suffice to cause adequate change of air—the opening of a door or window will upset the relative proportions between inlets and outlets, probably causing draughts. Moreover, with a number of people seated on the floor area, and with air entering around the lower portion of the walls, it can only arrive at those in the centre after becoming fouled by passing over the bodies of those nearer the inlets; but it is more than likely that the bulk of air passing through the room will travel from the inlets to the outlets without changing the air in the central portion. Every variation in temperature or in the force of wind outside will alter the conditions within, and during summer weather the temperature may be considerably higher outside than in; every factor is then reversed. Some improvement may be effected in cold weather by giving the incoming air an upward tendency and providing upcast flues as outlets with well-distributed openings near the floor level. The incoming air will then fill the upper portion of the room, gradually descend, change the atmosphere throughout, and pass away up the flues; but this arrangement of flues is not altogether satisfactory in summer weather, and even under such conditions change of air will fluctuate with every variation in the force of the wind outside. Consequently, with the best possible arrangements, so long as natural means alone are relied on, there must be constant, intelligent, and personal attention if comfortable ventilation is to be secured; nevertheless I am bound to confess that with care in the design and arrangement of suitable inlets and outlets, with adequate heating power, and with proper means for regulation, it is quite possible with personal attention to secure reasonable ventilation by natural means in buildings only occasionally occupied. None but very sensitive people are quickly affected by breathing a partially vitiated atmosphere, and few remain for long at a time in crowded places, so that when rooms are unoccupied windows and doors should be freely opened, and ample change of air secured. If this were regularly done, and thorough cleanliness were observed in and about buildings, there would be less cause for complaint of defective ventilation.

Every individual by respiration and exhalation throws off moisture and animal matter, and when a number of people congregate within an apartment the defilement of the atmosphere is considerable. Rapid change of air will carry much away, but with defective ventilation much is deposited upon exposed surfaces in the building in consequence of variation of temperature, and only prolonged and greater change of air than would be tolerated while a room is occupied will dissipate the contamination.

In the hope of disposing of the charge which has been made against me, that I am a prejudiced advocate of "plenum" ventilation, I now state most distinctly that unless it is continuously applied it is questionable whether it can be permanently successful, and I am not inclined to advocate its employment unless its advantages are considered worth the cost of continuous working. I cannot think it is sufficient to ventilate a building simply for the periods during which it is occupied, and then to stop the mechanism and bottle up the air until the next period of occupation.

Let me illustrate this by directing your attention to a railway carriage. Standing still, how stuffy it often is, particularly in hot weather; but when rapidly moving along it is freshened up. Yet, on again standing still, it loses its freshness. That is an example of ventilation produced by mechanical means intermittently employed.

Now I wish to explode another fallacy.

Downward ventilation has been termed "down draught," apparently in the hope of condemning it by giving it a bad name. Advocates of the open fire have stated that to propel air into the upper portion of a room and let it go out from the lower portion is unnatural. Fortunately this can be easily disproved. Take an ordinary room with an ordinary open fire and smoke flue. Test it as you will, and, apart from occasional strong winds setting up adverse currents, resulting at times in what are termed "smoky chimneys," it will be found that the only detectable outgoing of air takes place by the open fireplace flue, the lower opening of which is about 2 ft. 6 in. above the floor level. Many people open the upper portion of a window when the temperature of a room, heated by an open fire, is excessive, holding the idea that they are letting out the hot air; but with rare exceptions the temperature of the room is then actually lowered by letting in a larger volume of colder air, which compels a more rapid outgoing of heated air up the flue.

It is true that in most cases no special inlet for air is provided, and that in consequence air enters by any casual, and probably dirt-concealing holes, cracks, and crevices—mostly around the lower portion of the room—whence it makes its way in narrow streams, moving with considerable velocity towards the fireplace, causing unpleasant draughts, while little change of air takes place in the upper portion of the room. Yet, if the same room were provided with a suitable inlet at a foot or two below the ceiling, on the same side as the fireplace and as central thereto as may be, the incoming air would become tempered by contact with the ceiling, walls, furniture, etc.—previously warmed by radiant heat from the fire—it would, by its inflow, force the atmosphere of the room downwards towards the fireplace opening and up the flue to the open, without causing discomfort to occupants.* Under these conditions air is propelled into the room from a reasonable elevation, where it is generally fresher than near the ground level and more free from chance contamination. Force of wind outside, varying as it does in intensity, will materially affect velocity of change within. I have therefore devised a simple automatic regulating inlet, consisting of a curved enclosure to a resistless flap hung eccentrically so that the area of the inlet opening is diminished proportionately to the force of wind playing against it; but satisfactory results can be obtained even without this refinement if the inlet be provided with louvres for distributing the air at low velocity. I am perfectly aware it is not the method usually adopted, nor is it the one recommended in most works on ventilation. Do not, however, condemn it without proper trial; think it out, and you will, I believe, come to the conclusion, as by practical experience I have, that it is most effective in securing the efficient ventilation of an apartment; and if so, then the relative positions advocated for inlets and outlets with the "plenum" system are correct.

Complaints being so frequent of defective ventilation—even in buildings where outlay has been incurred in the expectation of securing, let us say, comfortable ventilation by natural means—is it surprising, when we consider the marvellous results of mechanical power, now used for the benefit of mankind in almost numberless ways, that attempts should be made to employ it for improving the ventilation of buildings?

Mining operations and many occupations have for years been carried on which would have been impossible without the assistance of ventilation brought about by mechanical means. Thousands of power-driven rotary fans and air-propellers are in daily use, proving the possibility of changing the air of enclosed spaces. Centuries ago the necessity for securing greater change of air within buildings than could at all times be naturally procured was recognised, and a few advanced minds suggested the employment of bellows and other primitive appliances worked by hand or water power. I have seen quaintly illustrated treatises on the subject; and although failure doubtless resulted from inadequate knowledge and appliances, there is no reason why, with air-propellers and power appliances brought to the high state of perfection they are to-day, we should not take advantage of them for securing ventilation within buildings.

It is no argument to say, "I don't like plenum ventilation," or even to point to failures which have occurred; nor is it sufficient to bring forward some fanciful idea that in an undefined manner air moved by mechanical power is deprived of an unknown vital essence. It has been suggested that by warming air otherwise than by the sun's rays this intangible essence is destroyed, and that is given as a reason why some people condemn plenum ventilation; but it is altogether begging the question, because in summertime, when "plenum" ventilation is so effective in maintaining a cooler atmosphere within doors than in the open, no heating is employed. Will it then be contended that, by lowering the temperature, such will-o'-the-wisp essence again disappears? Unfortunately my scientific knowledge is not sufficiently profound to enable me to determine if there is even an element of truth in these imaginings; but even if there be, which I strongly doubt, it is easy to demonstrate that with a carefully devised installation of "plenum" ventilation the necessary warming and cooling of air are effected with less chance of deterioration than by any other method. In addition to which the air is drawn from sources known to be at a distance from contamination; it can be cleansed from suspended impurities, brought to suitable hygrometric condition, and passed on to apartments without contact with impurity.

I am, perhaps, as painfully conscious as anyone that there have been many failures with "plenum," and so there have been with every other method employed for securing ventilation; but my experience convinces me that failure is not the fault of the system, but that it results either from want of knowledge and experience on the part of those who installed it, or from neglect. It is only by careful comparison of results and a minute examination of the means and methods employed that a true estimate of its value can be ascertained. Personally I have not the faintest doubt that by the "plenum" system the efficient ventilation of a building can be effected. The principle is perfectly sound; yet I realise there are two sets of objections to be met: the first I class as purely fanciful, most of which I have already dealt with; the second are more tangible, and relate to the means and appliances which should be employed and the

* See article on "Ventilation" in "Modern House Construction," Vol. V. (Blackie and Son, Ltd. 1899.)

cost. To review all the means and appliances at disposal is quite out of the question on the present occasion, but they have a very decided influence, not only as regards partial or complete success, but also a direct bearing on the question of first cost and maintenance.

Much as I dislike making comparison between the work of others and that with which I have been connected, this discussion has been forced on, and we are to meet in the hope of gaining instruction which may be placed at the service of the public. Consequently I shall briefly compare, principally as regards costs of power employed, a few installations of plenum ventilation, and as I shall make use of information derived from printed particulars given by the engineers themselves, we shall at least have fairly reliable data.

Building.	Cubic feet of air per hour.	Change of air per hour.	Power.	Estimated horse-power.	Annual cost for power.	Annual cost per million cubic feet.
Glasgow, Art Galleries	9,050,000	Not stated, probably 3 times.	Electricity	66	*£2,695	£298
Manchester, Technical School.....	12,000,000	3½ ,,	,,	80	£3,224	£269
,, Midland Hotel.....	6,000,000	3 ,,	,,	40	£1,612	£269
Birmingham, General Hospital	13,000,000	7 ,,	,,	19	£766	£59
Belfast, Royal Victoria Hospital ..	5,000,000	7 ,,	Steam	5½	£100	£20

Consider the importance of such a comparison as regards the number of changes of air effected per hour. May not success in great part depend upon giving an adequate change of air? And surely the question of cost would be a determining factor in many cases.

Reference to the paper by Mr. Henry Lea given in the Institute *Journal* for December 10, 1903, will show how this economy in cost of power is effected. In the discussion which followed Sir John C. Holder personally testified to the success of plenum ventilation in the General Hospital, Birmingham, which he has systematically visited, one may say almost daily, during and since its erection, and I could produce a large number of letters addressed to me containing congratulations on the satisfactory ventilation of that and the Royal Victoria Hospital, Belfast; but I prefer to place before you one because it was not written to me, and because it is from an architect experienced in hospital design, viz., Mr. Batchelor, of Messrs. Carroll and Batchelor, of Dublin, neither of whom is personally known to me. It runs thus:—

"I had been greatly interested in the accounts I read from time to time of the progress of the Royal Victoria Hospital, Belfast, and more particularly in the arrangements for heating and ventilating it. I have had some experience of the plenum system, and have never been much in love with it. I looked therefore rather with distrust on a building which had been so designed as to make such a system obligatory. Mr. Henman is to be complimented and congratulated on his courage in designing such a hospital, and I am free to confess that the result, so far as I was able to judge during my short visit, affords him ample justification for his inversion of many of the accepted canons in hospital design. I was particularly struck by the wonderful uniformity of the temperature maintained in the hospital throughout the twenty-four hours—such as could not, I believe, be obtained by natural means. The freshness of the air in the wards was remarkable, and there was a complete absence of that peculiar odour which is familiar to everyone having to do with hospitals. These results are obtained, I was glad to see, without draught, nor was there any perceptible movement of air in the wards. Everywhere I went through the hospital I saw evidence of great forethought and skill in design, particularly in those small details which count for so much in the economical administration of the institution. The building is a credit to the architects and also to the contractors, who have put such honest and—if I may use the expression—sympathetic work into it. Everything appears to have been done as well as it was possible to do it."

It has been well said that the only way to arrive at a right judgment as to the practical utility of plenum ventilation is to carefully examine it in a building in which it has been applied with knowledge and experience. All I ask, in conclusion, is that the subject may be approached without prejudice or regard to merely personal interests and fanciful misgivings, for a right understanding by the architectural profession on the subject of ventilation must have a vital influence on the health and well-being of the people.'

Mr. S. Perkins Pick said that before commencing to offer any criticisms upon the hospital, he thought that every credit should be given to Messrs. Henman and Cooper for the courage—one might almost say the audacity—with which they had formulated and carried out in all its details a hospital building in a manner so utterly at variance with nearly all preconceived notions of buildings of this class. It must be a source of great gratification to them that the institution after eight months' occupation should have proved so absolutely satisfactory to those who had the working and management of it. He had had the pleasure of making a careful inspection of this hospital under the guidance of the superintendent, and he was bound to confess that in hardly any other instance had he ever received such a laudatory description from the authoritative head of such an institution; indeed, this enthusiasm was not confined to the superintendent alone, but the sisters, the nurses, the engineer, and even the patients themselves, appeared to be equally pleased with the general arrangements provided, and with the heating and ventilation system installed. Now, after stating this it might appear to be blowing hot and cold when he added that, in spite of all the satisfaction expressed, in his judgment the plenum system of heating and ventilating for a hospital was not essential; nor did he think that the advantages of administration gained by having the wards all on one floor were commensurate with the risks incurred, and the loss involved, by the omission of those side windows for prospect and ventilation which most of us so dearly love and appreciate. In hospitals the superficial area and cubic space required properly to attend to each patient were necessarily very large, and therefore the requisite changes of air were less difficult to obtain than in such buildings as assembly halls, workshops, schools, out-patients' departments, and similar places were a large number of people were closely packed together. For these latter buildings he was firmly convinced that, up to the present time, no system gave such satisfactory results as a properly designed plenum system, especially so when some mechanical means was arranged for creating a positive extraction of the vitiated air. In his opinion a hospital planned in separate pavilion blocks, arranged with windows on either side of the wards, with a bed between each, an easily cleaned ventilating heating coil between each pair of beds, and with central open fires was preferable. It appeared to him that this well-recognised style of building was more pleasant for the patients, and adapts itself so readily to effectual ventilation by opening the windows that the complications of a plenum system of heating and ventilation were unnecessary. Moreover, the fact should not be overlooked that in hospitals the majority of patients were in bed, and thus were able to protect themselves from any direct cold draughts which might occur. He knew it might be said that the ordinary atmosphere of some of our large towns was so laden with blacks and impurities that it was desirable to wash and filter the air before allowing it to enter a hospital, and in some densely populated districts where hospitals were on restricted areas this contention might be used as an argument in favour of the plenum; but at Belfast the new hospital was erected on an open site of six acres, with the prospect in the near future of this area being doubled, so that the contention did not, he thought, hold good in this case.

For operating theatres and out-patients' departments he was of opinion that the plenum system was not only desirable, but was almost essential; in the former because the heating and ventilation were easily controlled, and in the latter because a waiting hall crowded with people of the lower classes, and generally entirely surrounded by surgeons', physicians', and other rooms, it was almost impossible properly to ventilate without some mechanical appliances, of which none were better than the plenum. The arrangements provided at Belfast for the out-patients' department were, in his judgment, quite excellent, and, although crowded on the occasion of his inspection, the various rooms were entirely fresh and healthy.

He agreed with Mr. Henman that great caution was necessary in the application of plenum ventilation, and that full knowledge was required to apply the system successfully; indeed he would go further and say that, in his judgment, the causes of failures with mechanical systems of heating and ventilation generally, and particularly with the plenum, more often rested with architects than with heating engineers. He had heard of architects who not only matured their plans, but actually commenced building operations before deciding upon the system of heating and ventilation. Could one wonder at the failure of a system, particularly one like the plenum, which largely depended for its success upon flues of ample area and good lines, when arranged under such adverse conditions?

Another cause of failure in the plenum was that of defective drainage, especially when a building was upon a clay subsoil. This matter was so extremely important that it was difficult to overrate its significance. In some large institutions he had himself noticed that exposed drains had been arranged to cross ducts in an open pipe connected with an ordinary earthenware drain-pipe just outside the duct walls. Any settlement of the duct walls was sufficient to break the joint between the junction of the iron and earthenware drains. These ducts usually carry steam and other pipes, and consequently the temperature in them varies very considerably, indeed quite sufficiently to cause the same joint to be broken by contraction and expansion of the length of exposed iron pipe. In a clay subsoil it is extremely difficult to ascertain whether the damp in walls is ordinary ground moisture or whether it is a sewage saturation. To pump air along ducts where there was a possibility of this was, he thought, the most fatal danger to be guarded against, and wherever the plenum system was adopted he thought that all drains should be dropped below the level of the air ducts, and should generally be carried out with strong cast-iron pipes. Spacious ducts were requisite for carrying steam, hot water, and other pipes to the various blocks of all large institutions, and the same danger which he had indicated existed in all these buildings; but it was largely intensified in the case of plenum ventilated buildings.

Messrs. Henman and Cooper had at Belfast wisely provided a separate duct for the necessary hot-water and other pipes, the main air supply duct being thus kept nearly clear of them. The lines of drains appeared to have been so arranged as not to cross the main air supply duct; he was unable to ascertain whether or not they were kept below the level of the main duct, but what did seriously frighten him was the enormous length of drains which must of necessity be below the hospital buildings. There were the drains from the several operating theatres, and from a number of ward kitchens and bath-rooms, with the complications of traps and anti-siphonage pipes thereto belonging, the latter being all properly carried up through the roof. The whole system was, he was informed, of iron pipes, apparently planned and executed with great care; but the very unpleasant fact remained that there was a length of about 450 ft. of straight main drain, not reckoning the very large number of branch drains connecting with it, all below a dark though, it was true, well-ventilated space under the buildings. Mr. Henman would, no doubt, correct him if he were wrong, but the only traps to any of the fittings he could find were those immediately below the various sinks, etc., and some floor traps. If he were correct, it had not therefore been thought desirable to make use of that ordinary outside trap or gully which usually intercepts sink, bath, and other wastes before drainage finds its way into the foul pipes below the ground. There also appeared to be a lack of those inspection chambers to the drains under buildings which most of them thought were essential in complicated drainage systems for institutions like this. These no doubt were omitted because of the fact that

* The costs of running are worked out proportionately to the amount of power, presuming it is employed continuously.

they must, if provided at all, be below the hospital buildings. He could not help thinking that this drainage system might prove a source of difficulty in the future. Proceeding, Mr. Pick said :—

"Among other details I inspected the cast-iron vertical drain-pipes connecting the fittings to the drains, and, in the case of those which apparently received the wastes from baths and slop hoppers, the caulked lead joints already begin to show unmistakable signs of drawing. This contraction and expansion caused by hot water running down the pipes is very difficult to obviate safely in a system like that adopted at Belfast. In ordinary cases, where the pipes are all outside a building, the use of an expansion joint is an efficient method, because if the joint slightly opens, the pipe discharging into an outside gully obviates any serious objection; but in the case of this hospital it may be the joints immediately below the fittings, thus opening the drainage system to the hospital, or it may be the joints of the pipes below the building that will draw. From what I saw it does not appear likely that the drains can remain bottle-tight for any lengthened period. Possibly it may be argued that, supposing there were a few leaky joints in the drainage system, what does it matter, when there is a constant sufficient pressure of air from within the building to prevent any sewer gas finding its way inside? But most of us will, I think, agree that it is better to keep dangers of this kind at arm's length, by putting all drains outside the buildings where they are open to the atmosphere; and I think this one objection to the arrangement of a hospital on one floor, extending over such a large area as that we are discussing, and thus necessitating all these internal drains, would wisely prevent most architects from adopting the plan of a plenum ventilated one-story hospital.

"Another detail of the sanitary system to which I think exception may be taken is the low termination of the ventilation pipes to the water-closets at the end of the wards; these are carried only just through the roof at the balcony ends, and when the atmosphere is still it appears to me that there is some chance of a down draught from them being objectionable to any patients who happened to be on the balconies.

"The arrangement of the nurses' slop-room and the water-closet for patients I do not like. I am quite well aware that the objection I am about to make is found in many other hospitals, but that does not, in my opinion, lessen the fault of it, which is that the patients' water-closet is approached through the nurses' work-room, where they must spend a good deal of time washing utensils, mackintoshes, etc. Nurses, I know, become case-hardened, and do not seem to have, or at any rate are not allowed to show that they have, that delicacy about such an arrangement which most of us have; but is it not a little too bad to arrange a water-closet in a manner like this at Belfast and elsewhere, where the division between that and the nurses' work-room is merely a wood partition, which for good reasons is kept well off the floor, and finishes well short of the ceiling level, with the result that it must at times be very difficult for any, even a case-hardened nurse, to face it out? I certainly think that the patients' water-closet ought to be better separated from the nurses slop-room than is the case here, where the main point has appeared to be so to plan the sanitary annexe as to facilitate the one outlet in the water-closet for the plenum system of ventilation, which, I am pleased to add, acts in a remarkably efficient manner in ventilating the annexe. A somewhat similar arrangement is provided for the ophthalmic wards, where the patients' water-closet is placed in a corner of the bath-room; this, surely, is not so good a plan as providing a water-closet separately approached from the ward.

"The non-provision of any larders to the ward-kitchens is, I presume, explained by the proximity of all the wards to the main kitchen. But sufficient milk has to be kept there for the day and night supply, and this in a temperature of 60 degrees, cannot be an improvement upon the ordinary method of providing a small larder, well ventilated from the outside, for this purpose.

"I notice that Mr. Henman states that open windows with plenum ventilation are objectionable, and that by making all the windows of the sanitary annexes fixed he is able to delete the intercepting lobbies, which may possibly be justified in this case; but, speaking generally, I am strongly of opinion that it is a great mistake to construct fixed windows. There are many days in the summer time when it is difficult by the plenum ventilation to obtain that freshness in a building which is so desirable; in such cases why should the windows not be opened? What does it matter in such a case, if the flues are well arranged from sources of contamination, whether they universally act the right way or not? And, besides, in many classes of buildings are there not times when by opening the windows a good air flushing can be given to them without incurring the expense of running the fans at all?

"The engineering work of this hospital has undoubtedly been designed and carried out in a most careful and able manner. There are, however, some points about this portion of the work which might possibly have been improved. I consider that the bottom of main air inlets should have been at least 8 ft. above the ground level instead of about 3 ft., as they are. The boiler-house should have doors or shutters to prevent cold air getting to the boilers, and good top ventilation provided in lieu of the openings. The feed-water to the boilers was on the day of my inspection nearly cold; this is a serious mistake, as it not only increases fuel consumption, but is detrimental to the boilers themselves. The hot well which receives the condensed water is not a good plan; better arrangements can now be had by dealing with the various condense and waste mains leading from the several receptacles which contain steam by an arrangement of heater-condensers. The exhaust steam from engines, etc., after performing various functions in heating hot water, is allowed to go to waste; this is not the most economical arrangement. There are a good many steam traps in the buildings which might have been left out had the system of piping been laid out on more modern lines.

"The engines and fans for the plenum arrangements are excellent in design and finish, but whilst I say this, I cannot but feel that it would have been better for the engineering scheme had it been laid down more comprehensively, and made to embrace the general lighting of the institution by electricity, using the exhaust steam from the generating engines for supplying the whole of the hot water required, and the remainder used in the general heating system. Had this been done, the plenum fans and laundry machinery could have been driven by electric motors, and a considerable annual saving to the institution effected.

"Speaking generally of the plenum system of heating and ventilation I feel, in concluding, that it is only just and due to the architects and engineer to state that, in spite of any criticisms which I have offered in these remarks, the scheme as carried out in the Belfast Hospital is, in my judgment, one of the very best that has up to the present time been executed, and, whether other architects follow the daring lead of Messrs. Henman and Cooper or not, the enormous educational advantage that they have given us in having the boldness to carry out their convictions is, I feel sure, properly appreciated by every member of this Institute."

Mr. A. Saxon Snell said he had been reminded several times of a somewhat unguarded term he had used at the last discussion with reference to plenum ventilation. Whether that term was justified or not, he felt that it was a "huge mistake" on his part to have moved the adjournment of the debate on December 4 because thereby he committed himself to say something at length on the present occasion. As they knew, the original discussion was on Mr. Henman's Belfast Hospital, but the Council had altered it to one on plenum ventilation, and that was a somewhat convenient arrangement because the Belfast Hospital was the very incarnation of plenum ventilation. It was absolutely built for this system of ventilation, and its merits would stand or fall by that system. On the other hand they had not had a complete discussion on the hospital, and so missed doing justice to the very careful way in which the building had been designed. He believed that many people thought the building of a hospital was little more than the arrangement of the building upon certain well defined lines and the rounding off of corners, but as Mr. Henman knew and had shown it was much more than that. There was an enormous amount of consideration to be given to every possible detail as he well knew to his cost. He was very much struck with the enthusiastic care Mr. Henman had given to the building, and, if he might be allowed to refer to it, he could not help saying that it was a curious thing that Mr. Henman in the Belfast Hospital had reverted to a type of ward built by his (Mr. Saxon Snell's) father forty years ago. He referred to the wards of the Marylebone Workhouse which were of the same type though rather worse than Mr. Henman's because they had no top light. Those wards were built to accommodate 600 or 700 persons whom he was assured lived to quite a phenomenal age, but he would not recommend that form of ward as being fitted for a hospital. He thought it was somewhat unfortunate that the question of plenum ventilation had been canvassed so much in the Press by one or two firms commercially interested in the matter. He did not know whether they had been worried by their clients who were furnished with a little Blue Book which comprised a number of scientific remarks on ventilation and purported to be a report of the House of Commons on ventilation. They might have, as he himself had to point out that a little study of this pamphlet would show that it was nothing more or less than a string of quotations (including one of his own) put together to show that plenum ventilation was a mistake. There was really no need for architects to look at it because so many excellent papers had been read on the subject in the last two or three years at the Sanitary Institute, the Institution of Civil Engineers, and other bodies. He had no bigoted objection to the plenum system as a system, and perhaps the best evidence of this was that he had tried lately (and he was sorry to say tried unsuccessfully) to induce a hospital board to allow him to install it for the warming and ventilation of two operating theatres, and would very much liked to have done that because he believed it was really the only method by which those rooms could properly be ventilated and warmed. But they were exceptional buildings and his whole point was that for doing work under exceptional circumstances one wanted an exceptional system of ventilation, and he knew no better system than the plenum for that. The main point of issue was as to the class of building in which it was desirable to use that system; and with regard to that it seemed to him that Mr. Henman had somewhat "hedged," if he might be allowed to say so, on the present occasion, in referring to hospitals only. On other occasions Mr. Henman had let them know that it was only the question of expense which prevented him advocating it for ordinary houses. He thought that hospitals and houses might go together as one, as being buildings for living in, and it was with regard to such buildings that he objected to the use of the plenum system. He should not follow Mr. Henman through the very clever reasoning in the paper because it would take too long, and there were others present far more capable of dealing with that. Mr. Henman asked very rightly that they should treat the subject scientifically, but they should be consistently scientific and go deep enough into it. Mr. Henman commenced by defining the object of ventilation, and that was a dangerous thing to do. As Mr. H. G. Wells pointed out at the Royal Institution lately, definitions were very often misleading, and he thought Mr. Henman's definition of ventilation was also misleading. He would not pause to say why. He had only three points to make, and they had been made over and over again only to be ignored and dismissed by the advocates of the plenum system of ventilation as fanciful and indefinite. In the first place he thought that the downward ventilation was scientifically or mechanically wrong. If they wanted to move an object it was obvious that the best direction was in the line of least resistance, and if they wanted to move it along that line with as little mechanical power as possible they would take advantage of any other powers going in the same direction. That was what happened in the ordinary or natural method of ventilation. The principal contamination of air was from our own bodies, but that very air, contaminated as it was, was in a condition which created the very means by which it was taken away. They knew that it was warm, and, being warm, it was lighter than the colder air which surrounded it, and that colder air propelled it upwards. Therefore, when in plenum ventilation they caused ventilation downwards, it stood to reason that they had to overcome the upward force which was there before they began to move it, and he felt that this was scientifically wrong. His second point was that hot air was surely absolutely bad for breathing. It had been pointed out forty or fifty years ago that hot air was bad

air to breathe, and it was perfectly obvious because for every volume of warm air breathed there was a less amount of oxygen than in the same air at a normal temperature. It could be easily calculated how much less oxygen would be taken in a given time, and he did not think it needed argument to carry the point further. Then they were told to admire the extraordinary evenness of the temperature which could be maintained by the plenum system. Monotony was held up to them as a virtue. He confessed that that astonished him very much, for he supposed everyone knew how bad monotony was for them in any way. Anyone who had cycled would know how tiring it was to ride along a flat road for many miles, and it was the same with breathing. If they breathed warm air continually at the same temperature it became monotonous, and they became tired very quickly. He had not time to refer to the long passages for driving warm air into the building beyond saying that he knew engineers had recognised the evil, inasmuch as he had been told that some had suggested violet-coloured electric lights in the passages with the view of getting the beneficent effects of sunlight on to that enclosed air. Mr. Henman had shown a great improvement in having the ducts above ground. He remembered many years ago the late Mr. P. Gordon Smith speaking of an incident which occurred in his journey with the late Dr. Moratt and his (Mr. Snell's) father on the Continent to see a number of hospitals, and especially of certain mechanically ventilated hospitals. In most cases the machinery was out of order, and the systems were not at work, but in one hospital in Berlin it was working, and the superintendent showed them round with great enthusiasm, and pointed out the ducts where the warm air entered. In one ward he showed where it came in immediately under the door, and Mr. Gordon Smith remarked that it appeared that dust might easily be swept into it. The grating was taken off and Mr. Smith put his hand down and drew it out two inches thick in mud. At any rate, Mr. Henman had improved upon these channels. Still the air had to be carried along dark passages, and they knew that air not freshened by the sun became foul, and deposited a number of bacteria on the sides of the channels. It was a curious thing also that what we might call the harmful bacteria, like everything else harmful in this life, always increased and multiplied in the dark. In the sunlight they became harmless. There was one other thing he would like to refer to, which would, no doubt, draw from the practically minded person a great deal of criticism and perhaps some ridicule, and that was the moral aspect of the subject. The world was full of inventors designing any amount of things to improve upon the works of the Creator. Many of these inventions were of enormous benefit to our kind, but a great number of others were simply invented for getting over the abuse of nature. He supposed there had been no greater progress made in the last century in any science than in that of medicine, and yet the great medical men were unanimous in saying: "We can only mend you with our medicines; go back to nature; go into the fresh air and live purely and properly and do not come to us." Medicines were excellent in their way for getting over difficulties, and we are prone to fly to them at once, but they knew the effect of taking drugs too often was very bad indeed. It was much better to trust to the machinery of nature itself, even although it was a little harder at the time. Architects in the same way had certain responsibilities in advocating the natural method of doing things rather than the artificial. Unfortunately most of them had to do what they were told and make the best of bad circumstances, but there were plenty of occasions when their advice was sought, and when they had the opportunity of advising their clients as to the best method of doing things, and he thought they should be at one with the physician in trying to persuade their clients to have their houses built in such a way that they could live healthily instead of merely comfortably. No doubt it was a very good thing to be able to legislate for a large number of people, and to feed and clothe them and look after them; no doubt it was good to be an autocrat in that way, and rule and control men, but there was one thing much better, and that was to teach their fellow men to rule and control themselves.

Dr. S. Rideal said he had not read the paper nor had he seen the Belfast Hospital, but he thought he understood what the plenum system was, and he had read arguments for and against it. The speech of Mr. Saxon Snell was very interesting, but it was not what he would call a scientific statement of the objections to the plenum system. It was very pretty and poetical and the analogies were interesting, but still the subject was not dealt with in that speech from a scientific point of view. It might be perfectly true, as Mr. Snell argued, that if one could introduce the pure air of nature into hospitals it would be the best thing, but apparently Mr. Snell's father in the past had had to put up buildings to accommodate 600 inmates in the middle of a big town where the problem of getting fresh air was not by any means so easy as it was when they had a hospital standing like the Belfast Hospital, on six acres. They had to deal with the problem of the ventilation of hospital wards and buildings in confined spaces, and then he thought they must all admit that the natural method of opening the windows, and so introducing fresh air, was not a method which commended itself to them in the present century. There must be artificial methods of ventilation, and if one admitted the proposition that artificial ventilation was necessary, then the forcing in of pure air must be the method which commended itself rather than the methods of extracting air by means of fans. They were told that the dark passages allowed the organisms to settle down and multiply, but if they settled down in the passages it was so much the better for the air. If they did not do that, but went forward, then it was necessary to ensure that the air was rendered germ free before going into the hospital It was obvious from the illustration given by Mr. Snell of 2 in. of mud being found in the duct at a Berlin hospital that that was certainly not a method either scientific or commendable. But he thought it was possible to introduce fresh air without the objections mentioned by Mr. Snell. They could remove germs and they could remove dust, and could warm the air, and have a hot air capable of being breathed without the disadvantages mentioned. It was perfectly true that a somewhat less quantity of oxygen per respiration might be introduced, but, on the other hand, it would be germ free and dust freed, and physiologists would tell them that the necessary oxygen would be obtained by the person breathing a little more quickly. The removal of the products of combustion—of the *esprit de corps* as it had been called—of the human being was very necessary, and yet, on the other hand, it was extraordinary how very little ill effect was noticeable from the products of the combustion of gas in rooms. It had been asserted that the sulphur in coal gas was most deleterious in rooms. He had recently had occasion to go most carefully into the subject, and he found that the advantage of gas burning in rooms, from the ventilating point of view, where there was no plenum system of ventilation, was very great as compared with the electric light, and the quantity of sulphur produced was only 1,000th part of the quantity of sulphur produced by burning coal. The actual quantity of sulphur in the air of a room lit by gas was less than the ordinary quantity of sulphur in the outside air on a foggy day, and not much higher than the quantity in the air on an ordinary day. That was taking an ordinary room, with basic lined and plaster ceiling. When, however, they came to modern rooms, with thick varnished Japanese ceiling and so on, they had a very different state of affairs. In these modern rooms the decorations themselves caused the sulphur in such rooms to increase, because it was not absorbed, and they seriously involved the question of ventilation. In an ordinary room the ventilation through the walls and the absorption through the basic lining rendered the effects of the coal combustion in rooms not very serious. In conclusion, Dr. Rideal explained the working of Aitkin's coniscope, and said that by the means of that instrument one could determine the dust particles in different parts of a room very easily, and could trace the ventilation and get much better results.

The Rev. J. B. Lock said it appeared to him that they had been accustomed for years to mechanical ventilation. Some people spoke as if mechanical ventilation was new, but surely the fire was a mechanical method of ventilation. It was the vacuum system, and they had always been accustomed to get their rooms warmed and sweet by an ordinary fire, which really drew the air from the ground level and carried it up the chimney. The advantage of the fire ventilation was that they did not warm the air which they breathed. They warmed the furniture and the bodies of the people in the room, but the air they breathed was of the ordinary temperature to a great extent of the outside air, and he supposed they were all familiar with the fact that they could tell if they went into a room where there were a great many people whether there was a fire burning or not simply from the sense of freshness which it had. The mechanical system of ventilation by the ordinary open fire seemed as good a one as could be devised until one came to the fan. He had had to take the responsibility of assisting to decide on a system of ventilation at Cambridge, and in one building they decided to have the vacuum system and in the other the plenum. The plenum system they put into the medical school, because there they wanted more certainty in the ventilation. It appeared to them that the plenum system offered the means of providing a certain quantity of fresh air in a certain time. The vacuum system was more rule of thumb. By the plenum system they had the advantage of forcing air in passages, and by means of valves they could decide how much fresh air they would admit into each room, and it seemed to him in the case of a medical school that was an overwhelming advantage over any other system at present before them. With regard to the vacuum system, the arrangement one usually found was that the great chimney of the building was used as an extract shaft, and openings were made into this. Some people might do it scientifically, but he had not found any specimen of that—they made openings in it and hoped for the best. It was a very good system of its kind, and was very much like the open fire system. To illustrate one difficulty of the system, he might take the Leeds Medical School, which he had been over. They found there that the central shaft had in it an iron pipe, which was to carry the product of combustion up the chimney, and the warmth was to be distributed through this iron pipe to the central shaft. On some days this worked very well, but on others the heat in the shaft was not sufficient to get an extract for the top rooms, with the result that the air drawn from the lower rooms percolated into the top rooms, and they were told that the smell of the dissecting-room pervaded the whole building. This seemed to point to the necessity in any system of having sufficient mechanical force to have control of the extracts. It seemed to him that in certain cases the plenum system was one they could not do without. He had been over Pitman's School, in Southampton-row, and found that in that comparatively small building there were about a thousand young men and women at work during the day. They were supplied in each room with air by a fan working in the basement, and it seemed to him impossible to imagine any other system by which that building could have been made of real use except by the plenum system. While one hoped that architects and those interested would evolve the methods of applying these various systems, yet, as an outsider, he would be inclined to say that there was no system which should be run to death. They must consider what were the requirements of each particular case and apply the system which fitted it. He would like to say one word about what was called the natural system, and he must not speak exactly as he would like to speak, as he might speak too rigorously; but to say that a natural system without a fire—and the fire was a mechanical system—could ventilate throughout the year a building which had a great many people in it was absurd. They would have to depend practically on the wind blowing with sufficient force in the same particular direction every day of the year.

Mr. W. K. Parry (Dublin) said there was just one point which wanted bearing in mind in connexion with ventilation, which was the weight of air which had to be moved. He supposed few architects considered it, and he had not himself until he heard it pointed out that the amount of air moved in the room where the statement was made was about 20 tons in one hour. It would be impossible without resort to mechanical means to remove anything like that weight of air per hour, and if they had tried to deliver it like one would coals by a cart it could not be done quickly enough. He was not there to advocate the plenum system of ventilation, but he was interested in the system of ventilation, and there was one point brought

to his notice on which he believed the plenum system depended. If instead of the plenum system they had radiators, there was an enormous difficulty in keeping the radiators clean. Whatever might be said as to the difficulties of keeping the air passages connected with the plenum system clean, the difficulty was ten times greater when the dirt got into the folds of the radiator. He was concerned in the question of the heating and so on of a lunatic asylum, and he found that the patients selected these radiators as their spittoons. If the sputum was dried on the radiators the fresh air would come into the building laden with the germs. So far as the plenum system was concerned, it did away with the necessity for any such coils in a room, and they had them in subways, where they could be kept clean, and when the air came into the room there was no opportunity for the patient to foul it, as they could do when there were radiators in the room.

Mr. Harold Griffiths said he was somewhat surprised and greatly amused by the remarks which had fallen from Mr. Snell. Mr. Snell referred to air being so regular as not to be conducive to good health, and said that more variation was necessary. He omitted to say that with the plenum system the temperature of the air could be raised in the winter, while in the summer time it could be at least fifteen degrees lower in temperature inside the building than was the outside air. He thought that was all the variation that was necessary. As to plenum installations, he felt sure that if members visited buildings—either workshops or schools or any buildings in constant occupation, and especially those in the East End of London occupied by aliens—which were installed with the plenum system, and then went to another building not so ventilated, they would come to the conclusion that the plenum system was the right thing. There were four matters which, it appeared to him, had to be borne in mind to make a successful plenum installation. The first was with regard to air purification. He could not compliment Mr. Henman upon the success of the screen which he had adopted at the Belfast Hospital. He was aware that they were the general screens of jute or cocoanut fibre, but under no consideration could it be said to be satisfactory. If the air of Belfast was anything like the air of most of their provincial towns, it would not be many months before the screen showed the result of the impurities drawn through it, and although the screen was put so as to take down in sections, yet he ventured to say it would be impossible to remove all the soots and other deposits upon it. If any gentleman would walk past a screen which had been in use twelve months or two years in any installation within the United Kingdom, he knew he would find a distinct odour emanating from that screen, which he felt must foul the air which passed through it. A much better screen was that adopted by another patentee—a revolving screen; but that also in his opinion was not a perfect screen. His second point was in regard to the dust. He had visited about fifty installations, and had always found that in connexion with the heating batteries the ducts could be washed by the hose, but he had never seen the heating pipes so arranged to enable the dust to be properly washed off them. Recently he was called in to report upon complaints which had been made with regard to a plenum installation, and he found that many of the intakes had been partly closed up, and when he asked the reason he was told that the air which came in was bad air. He went down to the basement and made a careful examination and found that all the heating batteries were literally covered with dust, and directly these batteries became hot a very noxious and almost dangerous odour emanated. In his opinion the batteries should be galvanised or treated so that at least once a week they could be effectively washed with the hose in connexion with the ducts and vertical flues. His third point was in connexion with the velocity of the air delivered. Some patentees and architects agreed in delivering the air at a very low velocity, and others at a considerably higher velocity. If they had a very low velocity with the plenum system it was so sluggish that there was not what he might term sufficient "back" in the air properly to circulate it in the room until it found its way to the extract. Those in the other extreme drove the propellers between 500 and 600 revolutions a minute, and thus the air was delivered at between 6 and 7 ft. per second, and the result was a considerable draught. He did not know that anyone could lay down exactly the rate at which it should be delivered, but he should think it should be between 4 and 6 ft. The last point was with regard to the shape and form of the inlets. There was a tendency in some instances to save cutting the brickwork or to maintain the regular architectural features in others, and to form bends in the inlets, and the result was that the air had a tendency to shoot out in a horizontal direction and fall on the heads of people in the room instead of circulating properly in the room. With regard to the extract no lines could be laid down, and every case had to be taken on its merits, but in most of the schemes he had seen they had been much too small. If these things were borne in mind he felt sure that in all buildings where there was a considerable occupancy no better system of ventilation could be found than the plenum.

Mr. E. W. Hudson asked whether the advocates of the plenum system pinned their faith absolutely on the admission of pure air at a high level, and the extraction of the foul air at a low level. If that was the case experience had shown that it was not the right thing to do. He had read an account of such a system introduced by Sir Joshua Jebb into Pentonville Prison. He believed that the system had been condemned and whether it was in use now he did not know. It seemed to him, however, that the system was an entirely erroneous one. He would like to move that the discussion be adjourned because the matter had, he believed, a medical aspect. It had been largely adopted in the United States, and he had tried to get information with regard to it, but that had not yet come to hand. He understood that it was adopted at the Capitol of Washington and was not a success, and he was anxious to know whether they were going to use it for the large buildings at Boston and New York. He would also like to know what the leading architects of Great Britain thought of it as evidenced by the number of buildings in which it was being installed. He had seen notices in London that buildings were to be ventilated on the plenum system, and if they could get this information it would be a good thing.

The Chairman said he was afraid it would be impossible to have another meeting.

Mr. R. Langton Cole said they had heard a good deal about the monotony of air, but these mechanical systems had been in use long enough to enable actual facts to be obtained. Surely it would be possible to compare a modern, well-designed pavilion hospital of the same scale as the Birmingham General Hospital or the Belfast Hospital, and see what actually happened to the patients, and let some unprejudiced person tell them the actual result. In his opinion a mechanical system of ventilation was advisable and excellent for special cases, but for a hospital where the wards were built on the pavilion system it was not necessary.

Mr. A. E. Munby said he had been furnished with some calculations with regard to the use of furnaces for heating apparatus, and he found that 95 per cent. of the total work done was employed in merely forcing the air through the coals. One thing which always struck him as being neglected was the possibility of using the furnace, which was to heat the building, as a means of ventilation. They were in the habit of installing furnaces for heating so that the air was drawn in through the boiler-house door which seemed rather wasteful. There was no reason why they should not be made to suck the air from the rooms. It would be interesting to work out the relation between the sucking power of a stove for purposes of ventilation, and the cubic space of the building which that stove would warm. It had been calculated that a furnace for the proper heating of a building was capable of changing the air in that building once every two hours. That would be useless for general ventilation, but it might be utilised for large buildings without additional cost.

Mr. Max Clarke said he took it they had come to decide more or less whether natural or automatic ventilation should be used as opposed to what was called the plenum. They had had a certain number of remarks on the merits and so on, and a certain number of remarks which applied more or less to natural ventilation, but they had had no information whatever as to what the advocates of natural ventilation did really advocate. Mr. Snell said something about it, and Mr. Lock said that if the wind always blew in the proper direction it would be satisfactory. He came with one or two ideas on the subject, and the only practical information he had received was that the plenum system was good in certain cases. But those certain cases he would like to think were all the cases where large buildings were concerned—that there was no other method whatever that would ventilate a large building properly. The object he took it was to change the air at a certain specific rate. As to what the rate was that could be regulated by the people who devised the system. He was not concerned with that now, as to how the air should be cleared, because all these were matters of detail. What he was a little concerned about was whether the forcing of the air in and the washing of it and the sending of it through heating batteries would or could change the air in its essence? That was really what he would like some information upon. He had devoted years to this subject which was a purely scientific matter. People told them that four parts in 10,000 of carbonic acid gas was as much as they could do with. Supposing that amount was reduced by the plenum system, would that be better than the air blowing over the ocean? Or was there some quality in the air of the ocean which they did not know anything about? No one would deny for a moment that patients would be better always in the sunlight, but they could not always have sunlight in Queen-square where he lived, although the square was crowded with hospitals; nor could they have it in the Liverpool-road or always at St. Bartholomew's Hospital. If it was necessary that the hospitals should be in such places, was it not better to send in to the patients air as pure as they could make it rather than trust to Providence? That was the question they had to decide, and all the little bickerings as to how it should be done, and as to the size and the bends of the pipes, were mere matters of detail which they would not learn all about at first. He thought that they as architects did not provide a proper system of tubes to carry this air along. He felt it was the smaller tubes which required very much more attention, and would like to suggest that someone should experiment with cast iron ones—glass-lined, or lined with vitrious enamel. Mr. Snell said that for exceptional work and exceptional buildings natural ventilation was not the thing, and he (the speaker) took it that every hospital was an exceptional building.

The Chairman said there was no doubt this was a most interesting and vital question for architects. At the present day when they erected buildings they must make up their minds as to the best way of ventilating them, and the time had gone by when they could ignore that. He certainly thought they had spent the evening well, and that they might spend another evening some day on the same subject. There was one matter he would have liked to have heard touched upon, and that was the question of cost, for it was a question which could not be left out of mind at the present day. Cost was not everything, but it did have an effect, and was one which the architect in such a matter could not ignore. He was afraid that the cost was rather in favour of the direct heating system by radiators, but they must remember that with the plenum system they were not only heating the building but were also ventilating it, and therefore in considering the cost of the two systems it was not fair to take the cost of the heating only in one case as against the cost of both heating and ventilating in the other. Personally he felt that with buildings largely crowded with people, such as class-rooms, and schools, it was most essential to change the air very frequently, and undoubtedly the plenum was the natural way by which they could secure a continuous change of air. He thought that if in the room they were meeting in there was some means of changing the air a little less naturally it would be a distinct advantage.

The Chairman announced that the next meeting would be held on June 20, at 8.15, for the presentation of the Royal Gold Medal. The memorial to the late Mr. Penrose in the Crypt of St. Paul's would be unveiled by Sir Lawrence Alma-Tadema on June 18, at 3.30, and members were invited to attend in memory of their respected past President. His (the Chairman's) last "At Home" would also be given on the evening of June 18.

MAGAZINES AND REVIEWS.

THE *Art Journal* is naturally largely occupied with a review of the Royal Academy, in connection with which it gives a separate full-page plate of Mr. Furse's "Diana of the Uplands," a picture which has won all hearts; and by a review also of the New Gallery. An illustration is given of Mr. Brock's sketch model for the Queen Victoria memorial, with some larger illustrations of the separate groups of sculpture. The whole monument is to be executed in Carrara marble, except the crowning group, which will be of bronze gilt, and the lions and figures with them on the pedestals around the outer circle, which will be of bronze. These flank the four flights of steps; the low quadrant walls between show indications of an intended bas-relief, whether in marble or bronze does not appear. The scale of the whole thing is immense, and when completed it will furnish a worthy and imposing monument to a great Sovereign, though we must regret that the architectural portion of the memorial has been so much cut down. Mr. Lewis F. Day contributes an article on "The New Lancastrian Pottery," made under the direction of Mr. William and Mr. Joseph Burton, of the Pilkington Tile and Pottery Company. The characteristic products of their system, of which nine examples are shown in a fine coloured plate, appear to be vessels in which shape and colour and the natural texture effects of the glaze are relied upon, without any formal decorative painting, the jars being simply shaped masses of fine colour, with only some natural markings resulting from the flow and break-up of the glaze. This ware seems, judging from the illustrations, to merit all that Mr. Day claims for it.

The *Magazine of Art* also devotes a good deal of space to criticism and illustration of the Academy exhibition; and Mr. Archibald Sparke, the Director of the Bury Art Gallery, contributes an article on the contents of that gallery, which seems to contain many good pictures and also some fine examples of Wedgwood ware. An article by Mr. Horsley Hinton on "Artistic Photography of To-day," an art in which we do not very much believe, is interesting to us because most of the examples of photography illustrated (the work of Mr. Frederick H. Evans) consist of illustrations of cathedral interiors. It is impossible to judge of the effect of photographs of architecture from a further reproduction which only shows them at second-hand, and gives a different surface texture from that of the photograph itself; but we are glad to see that any photographer who studies the artistic effect of photography is occupying himself with architecture. We have always maintained that architectural subjects are peculiarly suited to photography, and that they are very much neglected in most photographic exhibitions. "Cameo Cutting in France," by Mr. Cyril Davenport, is an article on a most fascinating subject, with some interesting illustrations. The "Symposium" on the subject of "L'Art Nouveau" is continued. Among the writers taking part in it this month are Mr. Marcus Stone, Mr. G. A. Storey, Mr. H. H. Statham, Professor Gerald Moira, Mr. F. Hamilton Jackson, all of whom write at some length and are all in the main adverse to it; so, in much briefer terms, are Mr. J. W. North, Mr. Aston Webb, and Mr. Luke Fildes, the latter of whom merely makes the characteristic remark "The 'newness' of art does not interest me." Mr. Wake Cooke thinks there is much promise in *Art Nouveau* "if rightly taken" (what does that mean?); Mr. Colton thinks that anything that keeps art moving is good, "but, like an aperient, we wish to forget it as soon as possible"; and Mr. J. Farquharson thinks that no new departure in art, whether Pre-Raphaelitism, Impressionism, or whatever else," has ever come and gone without leaving something good behind it"; which is about the only real crumb of comfort offered us on the subject. But it is hardly fair of the editor to label the communications at the head with a single phrase picked out from them. That by Mr. Statham, for instance, is headed with the words "perfectly detestable," but any one who reads it will see that this sweeping expression is *not* applied to the whole subject of *Art Nouveau*, but only to the one point mentioned in the writer's concluding paragraph, viz.: the employment of broken curves in ornament instead of tangential curves; and the heading is a misrepresentation of an article which is not really sweeping in its terms.

The *Architectural Record* (New York) devotes a great deal of space and illustration to the St. Regis Hotel, which appears to be the last hotel *de luxe* of New York, designed to surpass everything of the kind previously attempted. It is not worth all the importance here attached to it. Externally it is one of those enormously high triangular erections, on a site at the junction of two streets and running to a point at one end, which are the worst form of American high building. The illustrations of the practical portions of the interior are of some interest, but the ornate rooms appear to be inspired by the Hôtel Continental at Paris, which is certainly not a model of refined taste. We observe, by the way, that the bathroom belonging to the State suite of apartments, and therefore supposed to be the model bathroom of the building, has that unpleasant and insanitary arrangement of a pedestal water-closet in the same room and close to the bath, the uncivilised nature of which the Americans, with all their attention to sanitary refinements in other particulars, seem still unable to perceive. A more interesting subject in the same connection is an account and illustrations of the first American high building erected entirely in concrete-steel; *i.e.* concrete with steel stiffeners imbedded, in place of the usual steel-framing with a masonry or terra-cotta decorative skin. This is the Ingalls building at Cincinnati. The exterior appearance, though exceedingly plain, is not unpleasing; and there can be no doubt that this is both a much more truthful and a much safer style of building than the steel-framed one. Messrs. Elzner and Anderson are the architects. For the metal re-inforcement a system of cold-twisted square bars is used throughout.

"The floors are continuous slabs 5 in. thick, re-inforced with a mesh of ¾ in. square twisted steel bars from 18 to 20 in. on centres in both directions and strengthened by a beam or rib across the centre of the column bay 16 by 32 ft., dividing this into two panels, each 16 ft. square, without any other supporting beams.

"The columns have stiffening bars placed on two opposite sides near the surface to take the wind strains. They are further re-inforced near the centre by compression bars, which take up all such load as may be required in excess of the carrying capacity of the concrete alone. These bars not being in tension need not be twisted, and accordingly plain round bars were used of various sizes, according to location, from 2¼ to 3½ in. in the basement, diminishing in numbers and sizes in succeeding stories until they were reduced to 1 in. and then entirely abandoned at about the tenth floor, from which point on the concrete was sufficient to do all the work. . . . The question has been asked as to how the girders were connected to the columns. Very simple, indeed; the girder bars merely extend in between the column bars, and the concrete of the one being monolithic with that of the other completes and perfects the connexion, than which nothing could be more secure.

In the course of an article on "the present system of architects' charges," by Mr. Arne Dehli, a very strong attack is made on the five per cent. system, as in almost every way illogical and unsatisfactory. We have long been of the same opinion, and are glad to find it supported so strongly in an American architectural publication.

In the *Berliner-Architekturwelt* the principal architectural work illustrated is an extraordinary street front called the Alt-Bayern House, in the Potsdamer-strasse at Berlin. There is a flat centre, with end compartments on a segmental plan, and a modillion cornice which curves in plan round the segments, and then curves upward over the centre of the building like a wave, with nothing to divide or start the curves; a curious example of the passion of modern German architects for running everything into curves. The ground story is all glass, again in bulbous curves; above it the front is partitioned out by narrow piers of something like the half section of an early Gothic pier, and three tiers of small windows between. The central entrance is a *tour de force* in the shape of a projecting segmental arch curved on plan, with life-size nude figures standing out in high relief from it. How it is all carried there is nothing to show, for there is no visible abutment but windows. The materials are given as "Niedermendiger Basalt-lava," glass mosaic, copper, and bronze. Herr Wilhelm Walther is the architect. The whole thing looks horrible to English eyes, but it cannot be denied that there is a cleverness about it. Among the more sober designs illustrated is a good front of business premises in the Jerusalem-strasse by MM. Cremer and Wolfenstein, and part of the elevation of business premises in the Ritter-strasse by MM. Berndt and Lange, an original and not unsuccessful attempt to apply classic architectural details to a warehouse front which is nearly all glass and iron. In the ground story are plain heavy rusticated piers; on these are Roman Doric fluted pilasters (freely treated) which run through three stories of glass and iron, the small lattice girders that carry the floors visibly butting up against the stone pilasters; above this is a massive stone lintel carrying what may be called an attic, with solid piers sculptured with a figure in relief, above each pilaster, and two Ionic colonnettes dividing the space between, which otherwise is entirely glass. Over this is a plain but emphatic stone cornice, with heavy cantilevers over the piers and colonnettes. This attempt to press classic materials into the service of warehouse building is very clever, and the details are refined.

The *Architektonische Rundschau* does not illustrate any very noteworthy work; indeed, the competition design for an Evangelical church at Innsbruck is equally poor both as design and drawing. We come across MM. Cremer and Wolfenstein's work again in the shape of a Berlin street house, which is far more French than German in type, and good of its kind but not very interesting. A large building for a shopkeeper's or shop-men's union at Stettin has a good deal of character, as far as one can judge by a rather sketchy illustration, though it is rather crushed by its enormous roof; MM. Hart and Lesser, of Berlin, are the architects, but it is not quite apparent whether it is an actual building or only a competition design.

In the *Burlington Magazine* Mr. Clouston's article on Claydon House is concluded, and accompanied by some fine illustrations, showing the staircase with its fine and delicate iron balustrade, and the chimney-piece in "The Pink Parlour," a fine design in the main, but rather ragged in its carved detail. The straggling plaster decoration on the wall over it is an example of the mistakes of the Adam style; it is not only *rococo*, but bad *rococo*. The conclusion of Sir E. Maunde Thompson's article, "A contemporary account of the fall of Richard II.," is accompanied by eight curious and interesting designs from the Harleian MS. of the Chronicle of Jehan Creton. An article by Mr. Roger Fry on the exhibition of the French "Primitives" is the occasion of giving illustrations of several of the works in that interesting exhibition.

Arts and Crafts, which is called "a monthly practical magazine for the studio," etc., is a very useful publication for young art-students, containing minute descriptions of processes in various classes of art-production. There is, for instance, a description of the process of modelling a bust, with photographs of a bust by Professor Lanteri (now in the Academy) in various stages of development. Lessons in wood-carving and in book-binding, with practical illustrations are among the subjects. Perhaps the value of such a publication is most felt by young amateurs who wish for guidance in taking up this or that form of artistic handicraft. Students who are preparing to make a profession of any art want fuller teaching than any magazine can give them; but "Art at Home" should be greatly assisted by *Arts and Crafts*, as it gives description and illustrations of the actual process of working.

Knowledge and the Illustrated Scientific News, the new title of the monthly periodical formerly called *Knowledge* (which has changed hands), seems to have the same value in regard to scientific information which belonged to the paper under its former status, and is rather fuller and more varied in subject, but also seems rather more laid out for popularity, which was perhaps necessary. The most valuable and interesting paper is that on "The Mechanical State of the Sun," by Professor Sampson, which we recommend to the notice of those interested (as every one ought to be) in the physics of the centre of our system. There is a good illustrated article by Major Baden-Powell on the Aero-plane experiments at the Crystal Palace.

In the *National Review* Lord Lytton writes a short article on the subject of the Chantrey Bequest, summing up the case against the Royal Academy in a manner which is concise, logical, and absolutely unanswerable; a matter which will not trouble the Royal Academy, whose policy is to assume that they are infallible and to answer no one. Lord Lytton draws attention, however, to one answer on the part of an individual Academician, which had escaped our notice, and which seems to give some explanation of the proceeding of the Academy in always purchasing out of their own exhibition. Mr. Boughton averred that the Academy

could not purchase a picture of Whistler's which had been exhibited elsewhere, because by the Chantrey Bequest every work purchased must be exhibited at the Royal Academy, and by the Academy rules no picture can be exhibited there which has been exhibited before in London. As the Chantrey Bequest says nothing about exhibition at the Royal Academy, but only says the purchased works must be publicly exhibited, it appears as if the Academy, in its corporate capacity, either has not read the terms of the bequest or cannot understand them. However, it appears that there is to be a Government inquiry into the administration of the Trust.

In *Scribner*, under "The Field of Art," Mr. W. C. Lawton and Mr. Russell Sturgis write on the interesting questions suggested by the title "Poet and Artist" ("Poet and Painter" would more correctly represent the scope of the articles). Mr. Sturgis's article is the more interesting of the two, and he makes a good point in his comparison in regard to the form of expression in poetry and painting. He shows how exceedingly essential the form of expression is in poetry, taking as an example a well-known stanza of Shelley's—that commencing "When the lamp is shattered," and inviting the reader to consider how little impressive the thought itself would be if expressed in plain prose. But then, he adds, in painting the artistic language is not only an important element—it is *everything*. "Try to separate the thought in a landscape from the artistic language used in rendering that thought, and see where you come out!"

"Nor should anyone deceive himself by supposing that each artist, poet and painter, is busied with trying to represent or describe or relate something, each in his own language. That is not at all the case. No work of art that is worthy of the name has for its principal subject Description or Narration, or even Representation. The poet-artist, as the secondary consideration (*by the way*, as it were), may represent an old tree or house, relate a pleasant or a ghastly incident; but that is not the purpose of his work of art, either in verse or in painting. His purpose in each case is to produce a work of art. And the real difference between the graphic arts on the one hand and poetry on the other is that in the graphic arts the mere language, the use of the language, the glorying in and delighting one's self by the mere use of the language, is so very much—in nine cases out of ten—that the thought which has been nominally the purpose of the undertaken work of art disappears altogether and the noble language remains alone in the artistic result."

"A Sculptor of the Prairie" is the title of an article in the *Century* on the work of Mr. Solon H. Borglum (what an exceedingly Trans-Atlantic blending of names!), whose work we think we previously saw a notice of in another American magazine. Mr. Borglum is a student of the wild horse and the wild Indian (so much of him as is left), and the works illustrated show a kind of downright and original energy, but not sculpturesque style in the higher sense. Mr. David R. Francis, the President of the St. Louis Exhibition, contributes a short article on "The attractive features of the St. Louis Exhibition," which is in such an exuberant style of trumpet-blowing that one wonders why he even used the phrase "attractive features," as in his eyes it seems to be all one great glory of "attraction." It may be all that, but one rather feels that the praise would have come with more weight from some one not officially connected with the exhibition.

Harper includes, under the title "The city of beautiful towers," a description of a visit to San Gimignano by Miss (or Mrs.) Hale, with sketches by Mr. Walter Hale. San Gimignano is always interesting, but we hardly think "beautiful" is the adjective to apply to the towers, except in the sense of combined effect; as towers they have no special beauty either of form or association, being in fact the grim relics of a barbaric age of feud and fighting.

In the *Monthly Review* there is a curious fanciful article by Mr. Bernard Holland, consisting of "A Dialogue" between the Cathedrals of Amiens and Canterbury, the ancient cathedral retaining its old uses and the ancient cathedral put to modern uses. The points in the dialogue are partly theological, but there is something of more than theological or ritual interest in Canterbury cathedral's sense of discrepancy between its old memories and its modern experiences:—

"Sometimes I am tired of the crowds, and of their songs, and of all the sermons preached to them from my pulpit. I was not built for this kind of thing. At the end of Sunday I feel quite exhausted. Perhaps I am too old for modern ways. Often I wish to hear again the monks chanting their old Latin words and slow music in my choir, and to inhale the faint perfume of the incense. Once, not long ago, a sweet woman sang 'Salve Regina' in the darkness of my crypt. It cost me a pang of memory. And these excessive rows of monotonous and meaningless and mechanical lights, how readily would I part with them if I might have in exchange the soft, symbolic darkness, lit here and there by a few starry candles, dimly revealing solitary worshippers. I dislike these formal congregations. I do not care for hearty and popular services. I feel more like my old self on a winter afternoon, when they chant their evensong, and I am but a little illuminated, and very few mortals are in me. In the summer afternoons I am tired to death by the multitudes who traverse me, it seems, merely in order to gaze with dull satisfaction on my monuments. They do not understand me as the old pilgrims did, nor I them."

Others surely must have felt what is here so picturesquely expressed—the gulf between the life of which our ancient cathedrals were the outcome, and the life which surrounds them now.

"A Journey from Edinburgh to Paris in 1802," in *Longman's Magazine*, if a genuine diary of the period (and it has the appearance of being so), is interesting in the sketch it gives us of the realities of French travel, and of the aspect of Paris, in the days of the First Consul. We quote a part of the description of Paris. He contrasts the approach to London, with its villas and gardens and crowds of vehicles, with the solitude around Paris.

"Not a villa to be seen and hardly a mortal to be met with on the road. No coaches, nor curricles, nor pleasure horses, nor waggons: but here and there a few Englishmen going to Paris or returning, now and then a messagerie, or wretched stage coach, and straggling parties of whiskered soldiers, and, with the exception of these, all is silence and solitude. . . . In passing through the narrow streets of Paris on our way to the hotel, we were struck with the mode of disposing of the lamps. They are suspended in the middle of the street, about 15 or 20 ft. high, from a rope which runs across from one house to another. The lamps themselves are very large, something like the shape of the lanthorn upon the stern of a ship of the line. They throw a great light not only upon the street, but into the windows of the houses, so that at their windows on both sides any person may read by lamp-light, and the general effect is pretty. But the closes and lanes of the city, and with which, like Edinburgh, it abounds, are necessarily left in utter darkness. The streets are narrow and dirty, much like the Cowgate."

The diary purports to be that of "Robert Sym, Esq., Clerk to His Majesty's Signet." If it is not genuine, it is very well done.

The *Pall Mall Magazine* contains an article by Miss Marie Van Vorst, rather exaggerated in its appreciations, on the life and works of that talented but rather unequal and eccentric painter M. Paul Besnard, accompanied by a good many illustrations from his works; which, however, depend so much on the colour scheme that they can only be very inadequately represented in black and white.

In the *Gentleman's Magazine* will be found a very charming article by Mr. Alexander H. Japp, under the title "A Vision of Trees"; considerations as to their various picturesque characteristics and associations, with remarks on the truth of some references to them by poets—Tennyson especially.

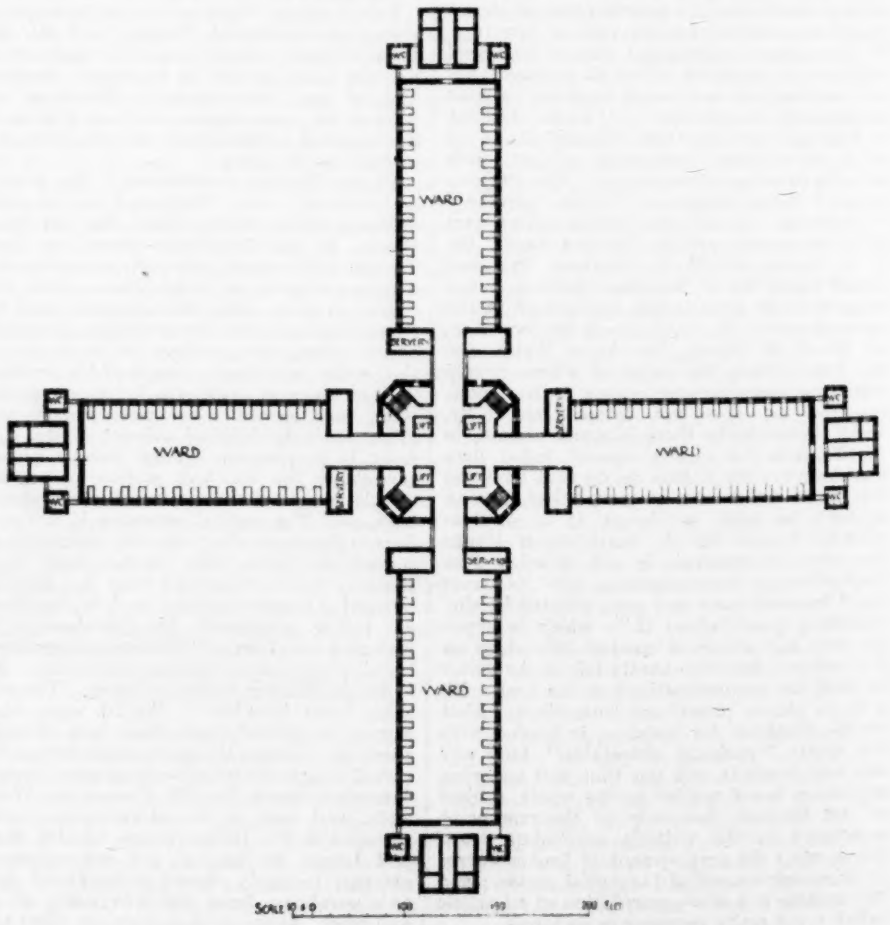
Illustrations.

A CITY TOWER OF HEALING.

THE suggestion upon which this design is based was contained in a letter from Mr. J. Y. W. Macalister, F.S.A., the Librarian of the Royal Medical and Chirurgical Society, to the *Times* a few months ago. He had recently visited New York, expecting to find a dislike to its famous "sky-scrapers" confirmed by inspection; but he wrote: "The result was just the reverse. The more I saw of them the more they fascinated me. Some of them were architecturally faulty, but their huge proportions made me forget architectural canons, and only admire the great bluff cliffs of masonry soaring far above the noise and dust of the surging streets. . . . I was carried to the top of several of them on electric lifts, and found pleasant roof-gardens, where one could sit and lunch, fanned by cool breezes, while below men and horses were panting in sultry heat, and from all enjoyed a magnificent view far into the country or out to sea. . . . In the heart of the city I visited two palatial clubs, each installed in the top floors of one of these towers. The noise of the streets was a pleasant murmur, the rooms were well windowed and full of sunlight, and would have made ideal wards."

A "sky-scraper" would solve the problem of providing an increase of hospital accommodation in a crowded city upon a limited site by a building of exceptional height. The ground and lower floors could be wholly utilised for out-patients' halls and official and administrative purposes, while any street frontages valuable commercially could be sacrificed, as the essential light and air are obtained at higher levels.

The wards would gain progressively in quiet, airiness, and sunlight as the stories ascend, until the fifteenth or perhaps the twentieth floor would be suitable for a loggia for open-air treatment. Ample lift service and detailed administrative accommodation would be obtain-



"A Tower of Healing." Plan.

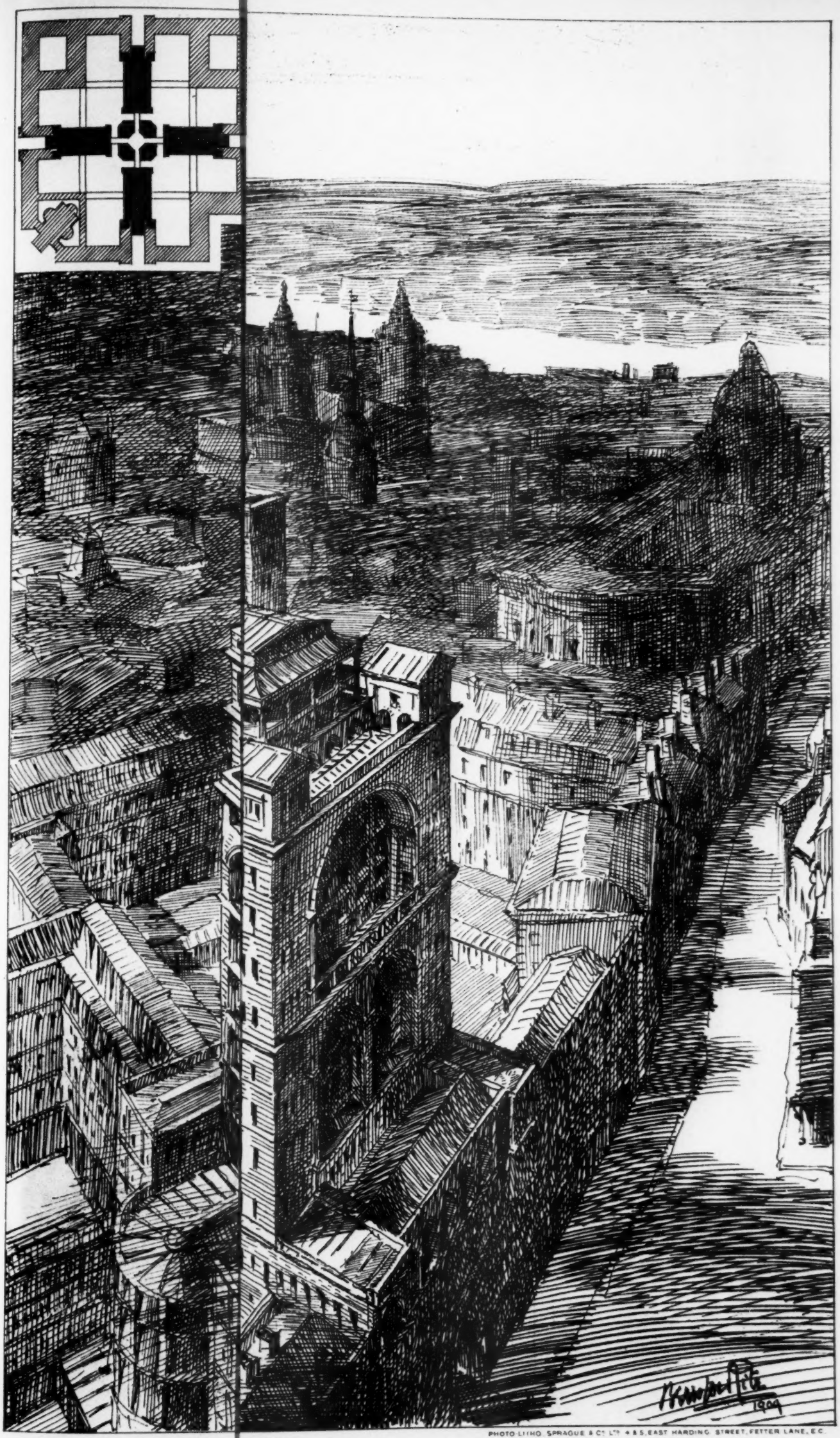


PHOTO-LITHO. SPRAGUE & Co LTD 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

ONDON HOSPITAL

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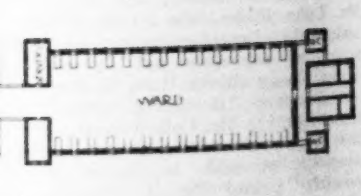
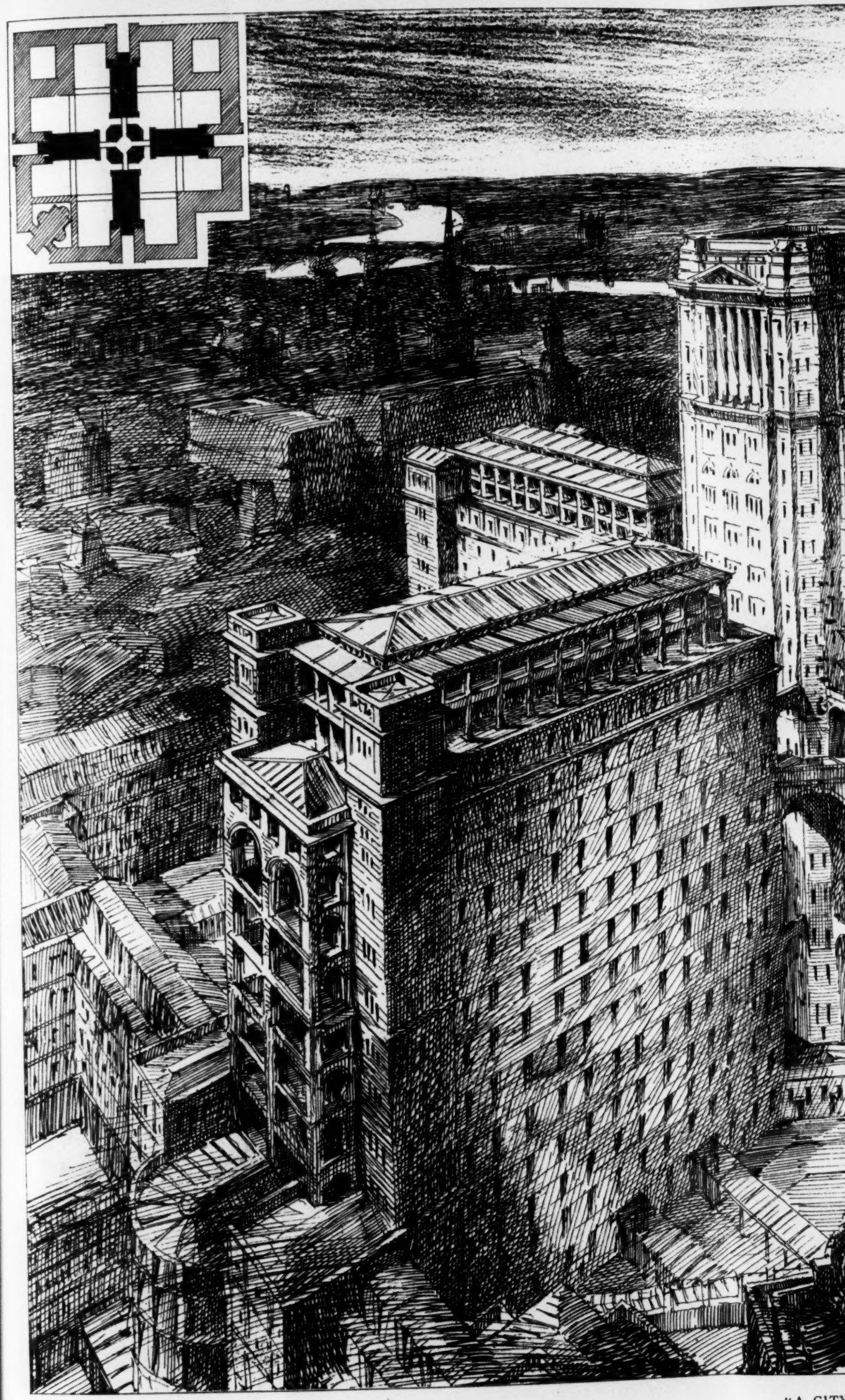


" *Plan.*



"A CITY
DESIGN SHOWING THE APPLICATION OF THE
By Profes

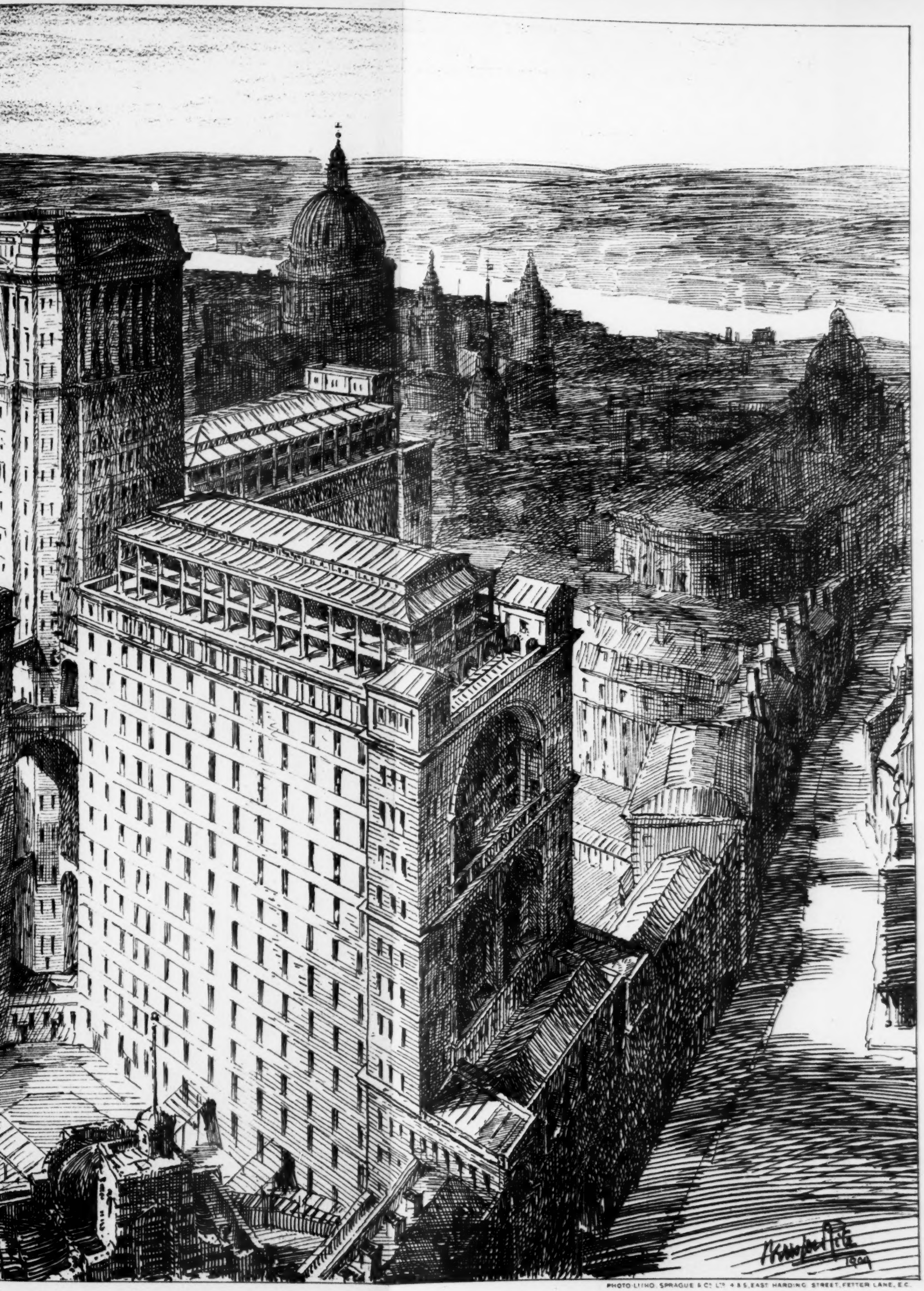
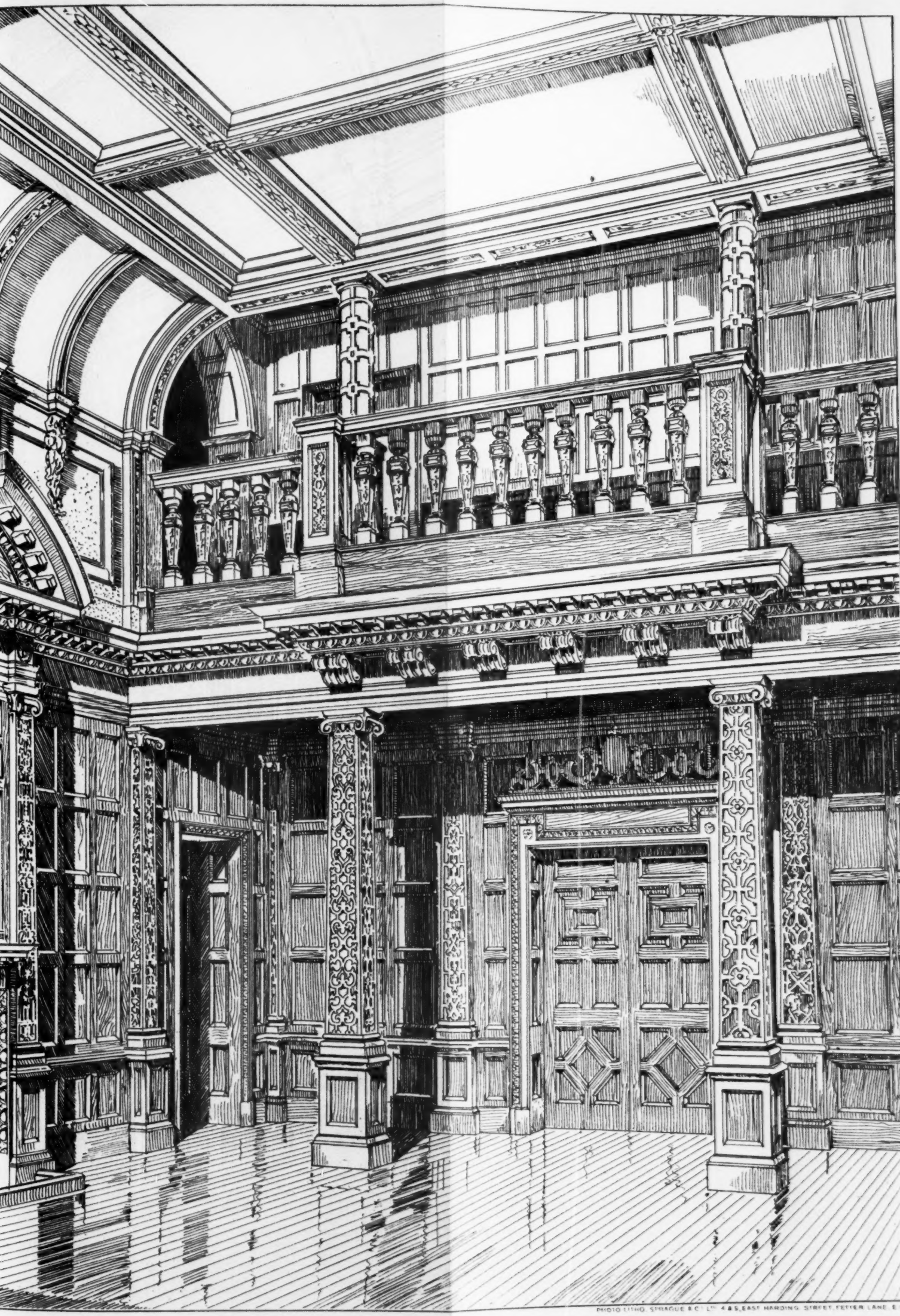


PHOTO LITHO. SPRAGUE & Co LTD 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

"A CITY TOWER OF HEALING":
OF THE AMERICAN HIGH BUILDING SYSTEM TO A LONDON HOSPITAL.
Y PROFESSOR BERESFORD PITE, F.R.I.B.A.

INTERIOR: HOLLINGTON HOUSE, B



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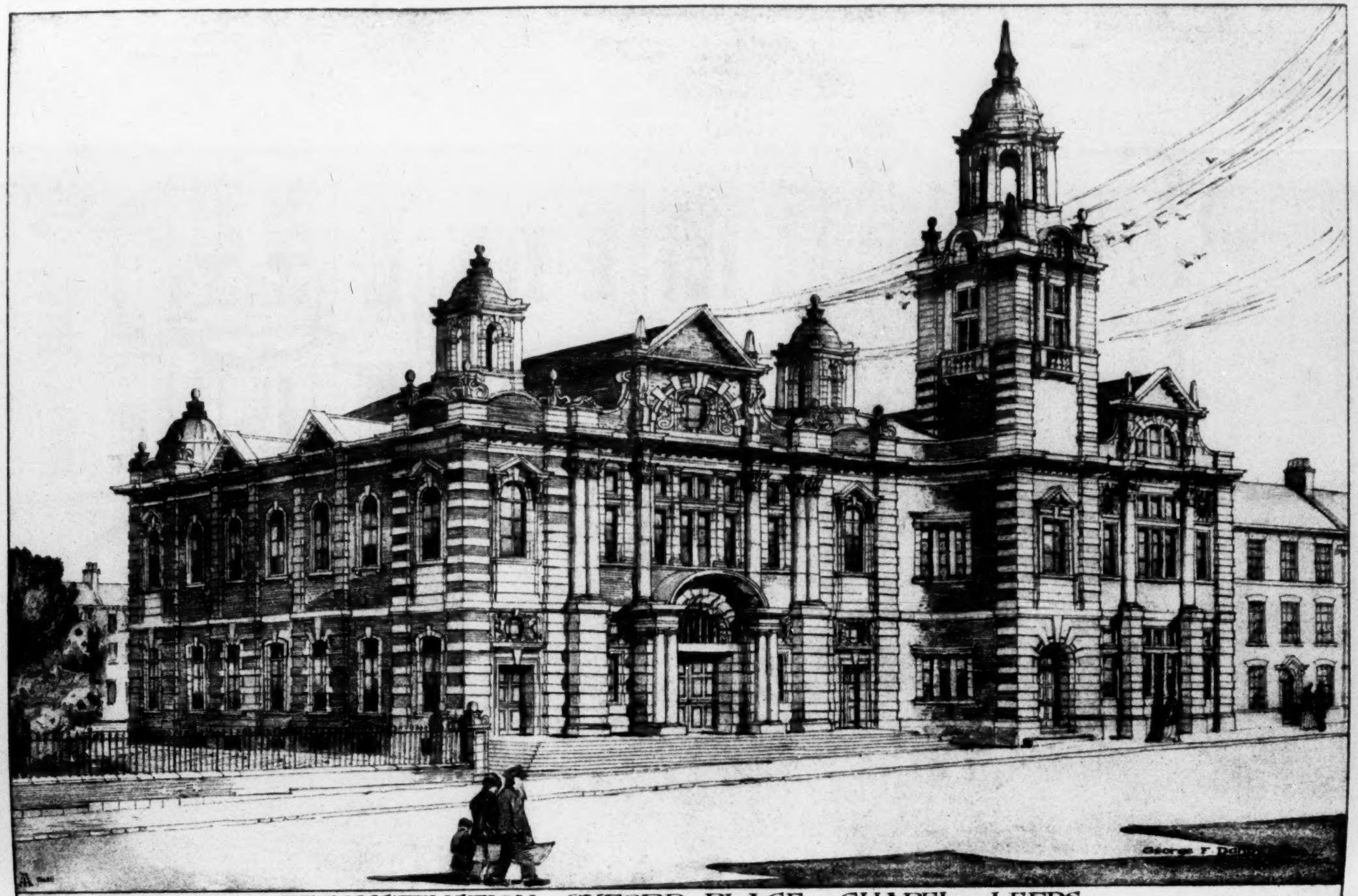
N HOUSE, BERKS.—Mr. A. C. Blomfield, F.R.I.B.A., Architect.



RECONSTRVCTION · OXFORD PLACE CHAPEL · LEEDS.

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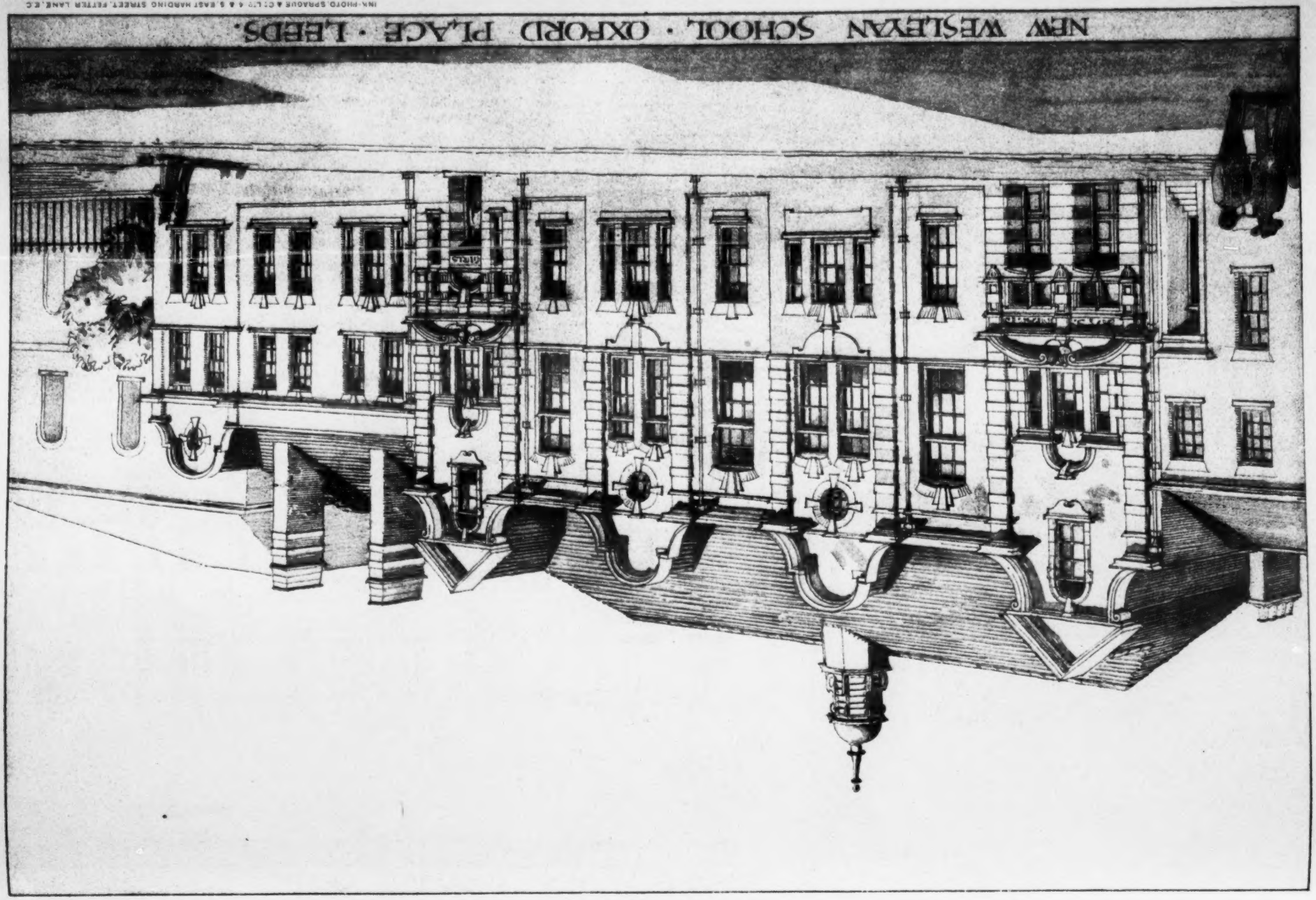
NEW WESLEYAN SCHOOL · OXFORD PLACE · LEEDS.



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RECONSTRUCTION: OXFORD PLACE CHAPEL, LEEDS.

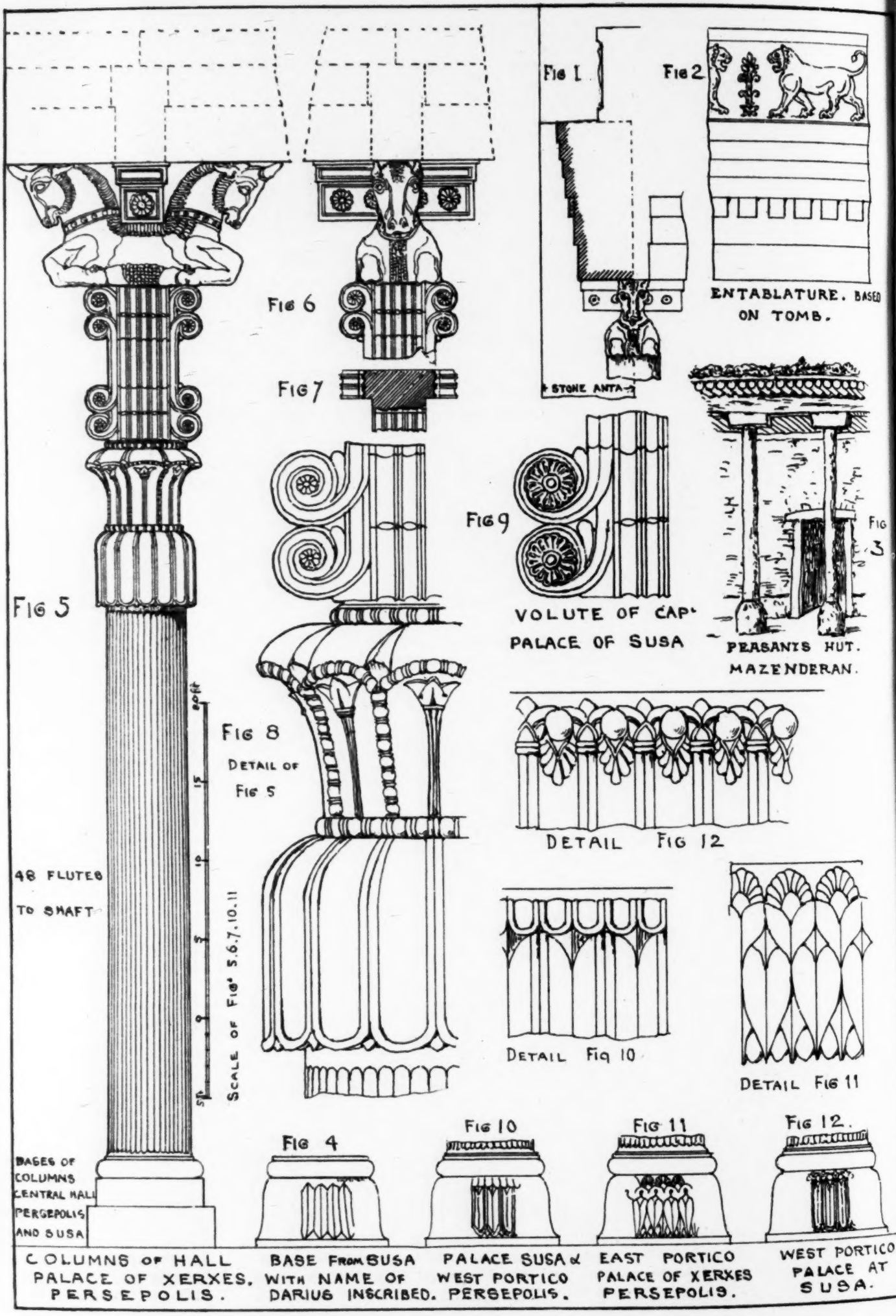


Fig 1
Fig 2
ENTABLATURE. BASED ON TOMB.
STONE ANTA
Fig 6
Fig 7
Fig 9
VOLUTE OF CAP PALACE OF SUSA
PEASANTS HUT. MAZENDERAN.
Fig 3
Fig 5
Fig 8
DETAIL OF FIG 5
48 FLUTES TO SHAFT
SCALE OF FIGS 5.6.7.10.11
DETAIL Fig 12
DETAIL Fig 10
DETAIL Fig 11
BASES OF COLUMNS CENTRAL HALL PERSEPOLIS AND SUSA
Fig 4
Fig 10
Fig 11
Fig 12.
COLUMNS OF HALL PALACE OF XERXES. PERSEPOLIS.
BASE FROM SUSA WITH NAME OF DARIUS INSCRIBED.
PALACE SUSA & WEST PORTICO PERSEPOLIS.
EAST PORTICO PALACE OF XERXES PERSEPOLIS.
WEST PORTICO PALACE AT SUSA.

ARCHAIC GREEK DETAILS.

Fig 14

FRAGMENTS FROM TEMPLE OF APOLLO NAUKRATIS. 560. B.C

Fig 21

NOW IN BRITISH MUSEUM.

CAPITAL FOUND AT DELPHI.
BY PROFR COCKERELL.

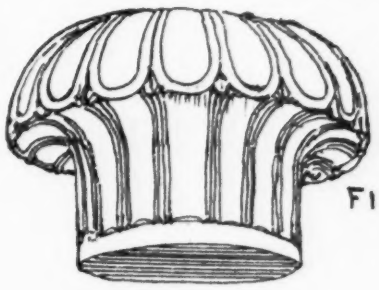
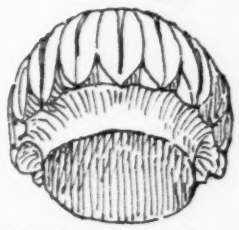


Fig 13

Fig 23

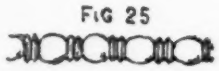


CAPITAL. ÆGÆ

Fig 24.

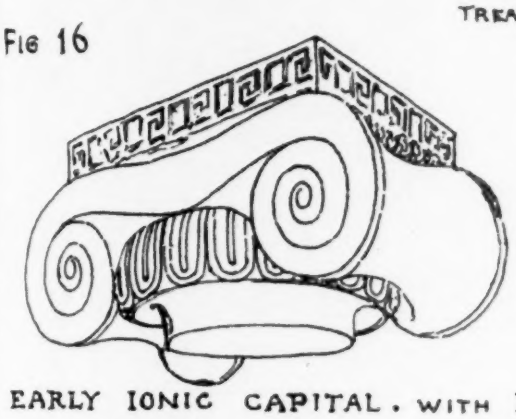
NEANDRIA.

Fig 25

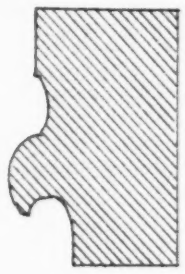


BEAD AND REEL
TREASURY OF CNIDOS.
DELPHI. C. 520. B.C

Fig 16



EARLY IONIC CAPITAL. WITH PAINTED DECORATION. MUSEUM, ATHENS.



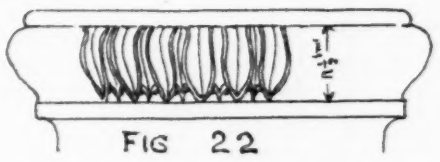
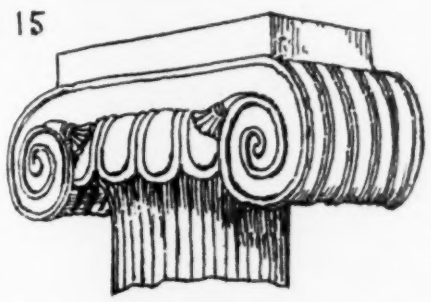
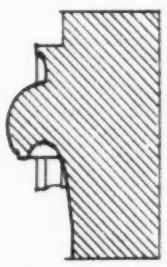


Fig 22

CORNICE OF CARVED DRUM
ARCHAIC TEMPLE EPHESUS.
BRITISH MUSEUM.

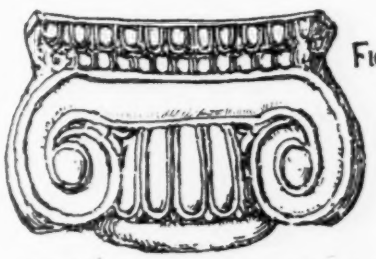
Fig 15





CAPITAL OF VOTIVE COLUMN
AT DELPHI. C 525 B.C

Fig 17



TERRA-COTTA CAPITAL
FROM GELA. SICILY
C 480 B.C

Fig 18

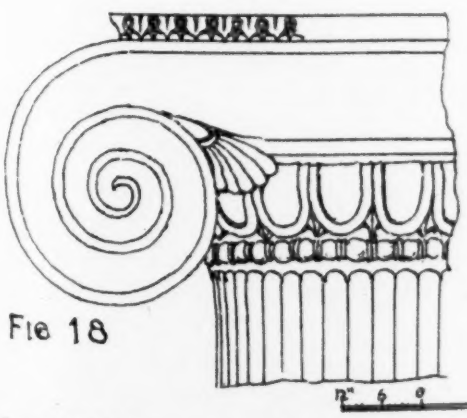


Fig 19

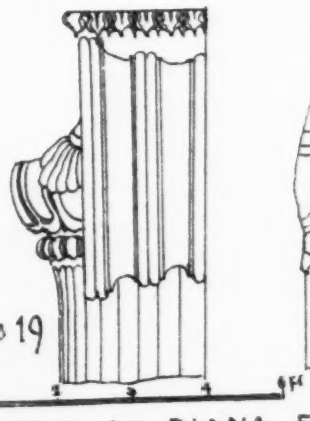
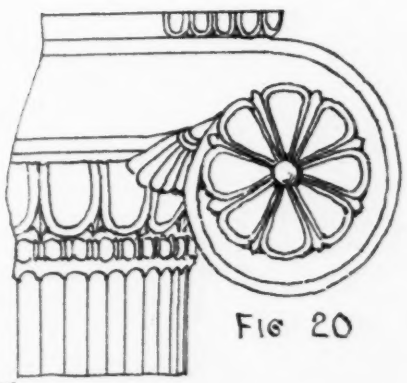


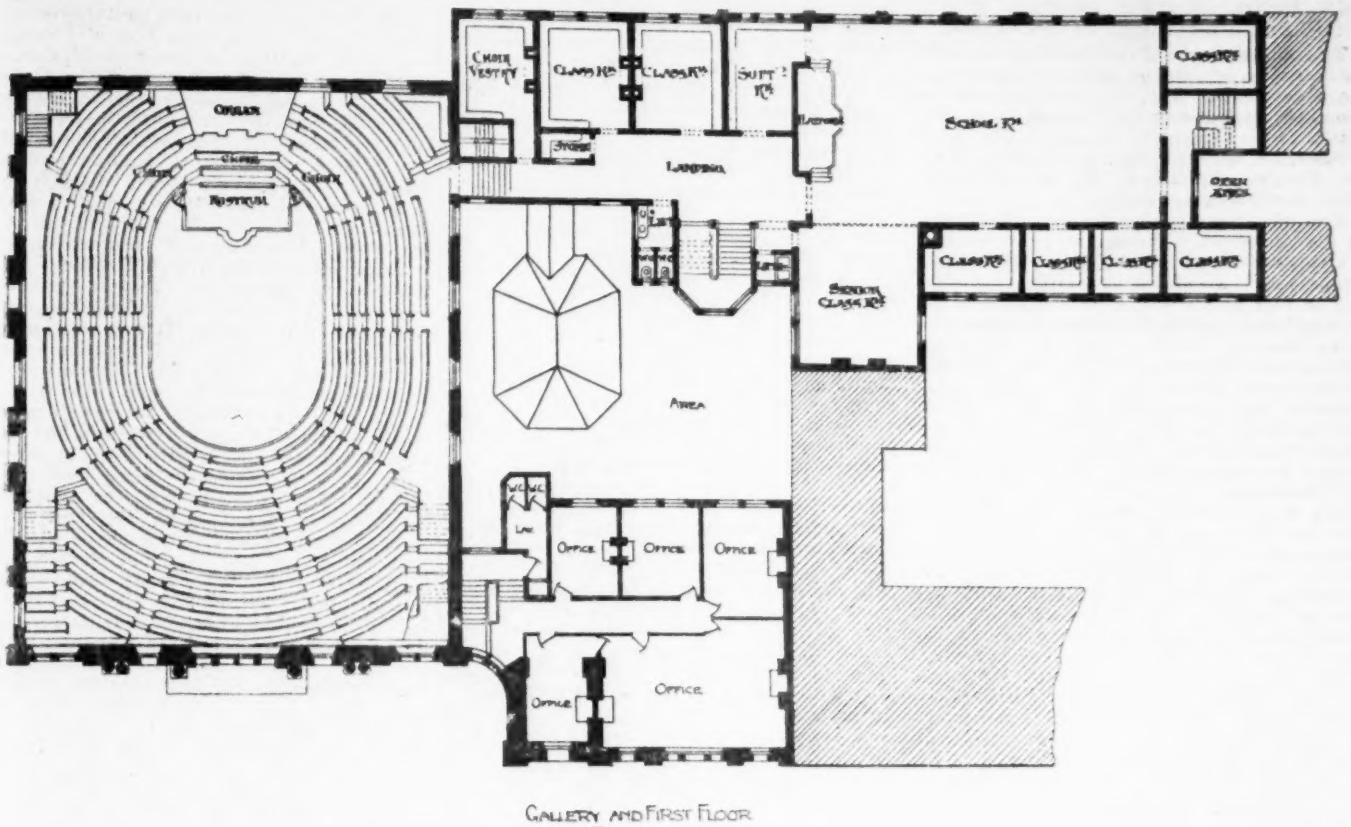
Fig 20



CAPITALS OF ARCHAIC TEMPLE OF DIANA. EPHESUS. B.C.560
AS RESTORED BY DR MURRAY. BRITISH MUSEUM.

PHOTO LITHO. SPRAGUE & Co LTD 4 5 5, EAST HARDING STREET, FETTER LANE, E.C.

DIAGRAMS.—By Mr. R. Phenè Spiers, F.R.I.B.A.



GALLERY AND FIRST FLOOR

Wesleyan Chapel and Schools, Oxford place, Leeds.

able in the central block, which would be continued upwards into a tower to contain the ventilating and smoke shafts which would be grouped in its angles. Operating theatres and sanitary offices and ward kitchens would be placed at the outer ends of each ward block, with practical isolation from the rest of the building.

The architectural treatment of a regular arrangement of lofty windowed blocks detached from and yet grouped around a central tower, would sufficiently express its aim of combining light and healing, even by contrast with the recent interesting experiment in hospital building upon one floor in close formation on an extended site, some possibilities of which were discussed at the Institute meeting last Monday.

BERESFORD PITE.

INTERIOR, HOLLINGTON HOUSE, BERKS.

THIS house is a new one, built on the site of a smaller one, near Newbury. The illustration shows the entrance hall, which is carried up two stories in height, and is panelled in oak, together with all the principal rooms on the ground floor.

The work has been entirely carried out by Messrs. Wheeler Bros., of Reading, from the designs and under the superintendence of the architect, Mr. A. C. Blomfield.

OXFORD-PLACE CHAPEL AND SUNDAY SCHOOL, LEEDS.

THE Oxford-place Chapel buildings occupy a commanding position on the west side of Victoria-square near the Town Hall.

The old Chapel was built in 1834, and on account of its old associations, its large seating capacity, and its good acoustic qualities, also on the score of economy, it was decided to retain it in the building scheme. With the exception of the old shell of the structure it has, however, virtually disappeared. The interior has been remodelled and reseated, and externally it has been recast with new elevational work so far as the principal façades are concerned.

The portion of the building occupied by the tower and the gable end to the right is entirely new. The tower as carried out has been simplified in design, and the attached building has undergone some modification, and its upper stories serve the purposes of a Police Institute.

The Sunday School block is situated to the rear of the site, with its principal frontage to Oxford-row. It takes the place of the old school building, which was pulled down owing to its insanitary condition and lack of suitability in other respects.

The buildings are faced with local red pressed bricks, and stone from the Morley Moor quarries is used for the dressings.

The expenditure upon the whole of the buildings has amounted to about 25,000*l.*

The work has been carried out from the designs and under the superintendence of the joint architects for the scheme, Mr. Geo. F. Danby and Mr. William H. Thorp, both of Leeds.

GREEK ART AND THE PERSIAN ORDER.

THIS plate contains the illustrations to the article by Mr. Spiers on another page, where the sketches are referred to by the numbers figured here.

WHITGIFT'S HOSPITAL OF THE HOLY TRINITY, CROYDON.

THIS interesting range of late XVIth century buildings is again threatened with demolition, on this occasion for a widening of the roadway at the corner of North End and George-street, opposite Crown-hill. The hospital was founded in 1596 by John Whitgift, Archbishop of Canterbury, for a warden, a school-master, and from twenty-eight to forty aged brethren and sisters to be chosen from amongst the household of Croydon Palace, and the poor of Croydon and Lambeth parishes, and of certain parishes in Kent. The building of the hospital was begun on January 17, 1596, and completed on February 29, 1599; the total cost amounting to 2,716*l.* 11s. 11d. The accounts of the work, the weekly payments of the labourers, and the statutes of the foundation are contained in the Lambeth MS., 275. One item cites the making of "the two trenches next the Crown and George Inn," February 4, 1596, and another is: "March 22, 1596, His Grace laid the two corner-stones north and south." A great portion of the timber was obtained from Lingfield and from the Archbishop's park, now Park-hill, and the sand for the mortar from Duppas, formerly Dubbers, Hill, Croydon. The buildings, of brick, are somewhat similar to those of Archbishop Abbott's Hospital, founded in 1619 at Guildford, where, however, the architectural details are more rich; the rooms are upon two floors, with an upper range in the gables; the chapel, which is partly panelled, is on the south side of the court. The labels over the windows in the quadrangle are finely moulded of red brick; the warden's room has a finely-carved mantelpiece, and some of the ancient glass is preserved in the hall. An item in the accounts relates to the glass: "1598. The glazing was finished; the glass in the hall window cometh unto 49*l.* 2s." Great economy was observed in the matter of fittings and furniture, rough knotted oak timber, available, it appears, for no other purpose, was used for the seats in the chapel. About twenty years ago was found in some old chests kept in the hospital a valuable collection of about four hundred legal and similar documents, court-rolls, indentures, etc., concerning the foundation of the charity, its history, and property, covering an interval from the XIVth century to the close of the XVIIth century. A deed of 30 Edward III. and another of 3 Henry V. relate to properties that still appertain to the hospital and its endowment; there were some bearing the founder's signatures and seals, and those of members of his family. Another instrument testifies that on the site now occupied by the hospital stood the Checquers Inn, which was bought for 200*l.* by Whitgift, who also paid 30*l.* for an adjacent house, and 80*l.* for the stay-cross and an adjoining parcel of land. The "find" comprised some curious old drinking-bowls for those seated "above the salt" and "below the salt." In 1880-1 the Charity Commissioners framed a scheme for the future management of the Charity and its revenues; the concurrent charities endowed by Whitgift had been, ten years before that time, extended by an enlargement of the Middle School and the erection of new buildings for the Grammar School in North End, Croydon; some of the old school buildings in George-street being then demolished. Whitgift died on February 29, 1604, having been Primate during twenty-one years; his monument with his effigy in the parish church of Croydon, where he was buried on March 27, was restored in 1888 by the governors of the Charity, and in that year was unveiled a window to his memory. The hospital buildings were repaired fifty-five years ago, but remain in almost their pristine condition as erected in the life-time of their founder and patron. His own set of rooms, including a kitchen, form a curious exemplar of domestic life as in his day.

At their meeting last week the Society of Antiquaries unanimously adopted a resolution in favour of the preservation of "this interesting and beautiful building which still effectively serves the purpose for which it was erected three centuries ago."

THE INCORPORATED BRITISH INSTITUTE OF CERTIFIED CARPENTERS.

THE annual dinner of this Institute was held on Saturday last at the Holborn Restaurant. Mr. John Wilson, J.P., the President, was in the chair, and among those present were the Master of the Carpenters' Company, Mr. Percy Preston, Mr. W. Busbridge, Mr. Houston, B.A., Mr. Fletcher, A.R.I.B.A., Mr. W. E. Cutter (Hon. Secretary), and others.

Following the usual loyal toasts, the Master of the Carpenters' Company gave the toast of "The Incorporated British Institute of Certified Carpenters." He said it was extremely gratifying to him to know that carpenters took so much advantage of the schools and lectures which were provided by the Carpenters' Company. He was somewhat connected with the carpentry trade himself, for he employed a great many men in the art of carriage-building. There was no doubt that if a body of men combined together and formed themselves into an institute it was an extremely good thing, not only for themselves, but also for the trade. He knew what it was to belong to an institute in his own trade—not of men, but of masters—and he knew that that Institute was of benefit to the trade by giving an opportunity for discussing questions of interest to them, and he had no doubt the members of the British Institute of Certified Carpenters were able to do the same in the trade of carpentry. With the toast he had to couple the name of their President, Mr. Wilson, in whom they had a man who had been most intimately connected with the art of carpentry. He did not know any gentleman who was more *au fait* with the trade, and who grasped the situation more readily than he did. He was certain of this, that on the court of the Carpenters' Company they derived an immense amount of benefit from his advice, and without that advice the court would frequently go wrong in their judgments. It was therefore with extreme pleasure that he proposed the toast.

The Chairman, in acknowledging the toast, said he could assure them it was a great pleasure to him to be there that evening, and to see so many certified carpenters there. He believed that the inception of that Institute arose from the examinations held by the Carpenters' Company, and all the members of the Institute held the certificate of that Company. That association was of very great benefit because it singled out a number of men who were thoroughly capable and who were an honour to the trade which they followed. They would be glad to hear that the examinations at Carpenters' Hall were still going on, and that the number of students increased every year. This year he believed would be a record one as far as regarded entries, and at the last lecture the room was so full that they unfortunately had to refuse admission to some gentlemen who came rather late, though if they had come earlier he doubted whether they would have been able to have accommodated them. He hoped that a very large proportion of those who were submitting themselves for the examination this year would not only pass, but would also join the ranks of that Institute. They would also be gratified to hear that next year the Carpenters' Company were going to hold an exhibition. Most of them were aware of the nature of those exhibitions that they had held in the past. Next year they were going to hold another one, notices of which would soon appear, and if any of the members of that Institute could send in exhibits they would be very grateful to them, and he hoped they would be successful in taking some of the prizes. He saw by the *Journal* of the Institute that the question of forestry was alluded to. It might interest them to know that the Carpenters' Company were taking a great interest in timber-growing, and they were doing all they could to stir up the landowners and the agents and the woodmen to bring about a better state of things in respect to the growing of wood in this country. It was a most serious thing that although they could produce something like ninety per cent. of the wood used in this country, we actually imported five-sixths of that wood. There were hundreds of thousands of acres of waste land in this country all capable of growing trees, including a vast quantity of bog land in Ireland which could be brought into cultivation. Other countries were going very far behind in their supply of wood, and it would become a serious question in the future as to where we should get our wood from. He hoped the Carpenters' Company would be able to do something to arouse the public of this country to the importance of growing wood. It was of great importance to carpenters that they should have a good supply of wood, and it was a very great pity that they should not use homegrown wood instead of the imported product.

Mr. Fletcher, in proposing the toast of the Worshipful Company of Carpenters, reminded them that every member of the Institute must hold the certificate of that Company, and in his opinion a better trades union certificate did not exist. He (Mr. Fletcher) was a believer in trades unionism. He was aware that people who knew nothing about such bodies said they were a curse, and no doubt many of them were run on wrong lines. A trades union should be run on the lines that every man who belonged to it should be a competent craftsman, and when he was he was entitled to a competent rate of pay; but, unfortunately, trades unions generally put the cart before the horse. That being a trades union, they ought to be very thankful to the Carpenters' Company for taking them under their wing, because that Company was really one of the oldest trades unions in existence. Since the action which the Company had taken some years since in instituting lectures and classes, it must always stand at the head of their craft. The last time the members of the Institute dined together, it was at the invitation of the Carpenters' Company, and he was very pleased to think that that night they had the Master as a guest. They looked to the Carpenters' Company not only to know the whole aims and objects of their Institute, but to back them up and help them to go right. He looked forward to the time when the Carpenters' Company would be the leading spirit in the craft. It was founded by carpenters, and so was that Institute, and he hoped it would not fall into the errors of some of the other City guilds and allow men who were in no way connected with the craft to be elected to its body, for by reason of that many of the guilds had been drawn away from the crafts for which they were originally founded. Fortunately, the Carpenters' Company had been in the forefront as regarded the education of carpenters, and within the last fifteen years it had done wonders for the craft. He (the speaker) was a director of their schools at Titchfield-street, and any gentleman who went there and saw the work done in the carpentry classes would be simply amazed. The Company had made a home for their Institute; indeed, but for them it would never have existed, and he was sure they would always continue to help them forward in their work.

The Master, in acknowledging the toast, said it was extremely gratifying to him to hear the Carpenters' Company so well spoken of by those in a position to speak of what it had done, and he thought it augured well for the future of the trade when they saw such a gathering as that, composed of gentlemen who held the certificate of the Company, and he was told that those present represented only about one-third of the members of the society. Altogether 120 held the certificate of the Company, which showed that it was doing something for the craft.

Mr. Dixon, in proposing the health of the honorary members, said that they had as honorary members a number of gentlemen more or less intimately connected with the craft to which they belonged. Among those gentlemen were Mr. Busbridge, Mr. Hutton Freeman, Professor Adams, Mr. Blashill, Mr. Waterhouse, Mr. Mitchell, and Mr. Buchanan, who gave the Institute very valuable help.

Mr. Busbridge, in acknowledging the toast, congratulated the Institute upon the lines on which it was working, and prophesied a successful future for it.

Mr. Hutton Freeman also responded.

Mr. Phillips gave "The Officers and Council," and especially referred to the good work done by Mr. Cutter, the Hon. Secretary, and Mr. Dixon and Mr. Inkpen.

Mr. Cutter, in reply, said that was the first dinner they had held as an incorporated body. Now that the Institute was incorporated, it lay with the members to make it a big thing in the future.

Mr. Inkpen, the Hon. Treasurer, also responded.

The remaining toasts were "The Visitors," "The Dinner Committee," and "The Chairman."

ARCHITECTURAL SOCIETIES.

THE VICTORIAN INSTITUTE OF ARCHITECTS.—The last-received issue of the *Journal* of Proceedings of the Institute of Architects of Victoria, N.S.W., contains the Report of the Council presented at the annual meeting in February last. We learn from this that the number of members is now 108, viz.: One Life Fellow, fifty-two Fellows, four Honorary Fellows, and fifty-two Associates. In the course of the Report it is mentioned that, at the invitation of the Board of Public Health, the Institute was forwarding plans of some of the worst types of existing town-dwellings, that the Board might invite a competition for the best system or systems of ventilating such buildings in a cheap and practicable manner. During the year, the newspapers published an illustration of the postage-stamp which the Commonwealth Government intended to issue. The Council of the Institute considered the design utterly weak and inartistic, and expressed the hope that the stamp would be withdrawn, to prevent their Australian designers being held up to ridicule. Upon receipt of the resolution forwarded by the Council, the Postmaster-General thanked the Institute for its criticism, and added that any design of greater merit submitted to the Department would receive consideration. Fortunately the stamp had not been issued in Victoria. The Metropolitan Gas Co. had approached the Institute, asking for the insertion of a clause in specifications for new buildings, to the effect that the gas-pipes and fittings be tested and approved by the Company's inspector before the work is passed. The engineer of the Company (Mr. R. O. Thompson) met the Council in conference, and the suggestion was well received. In order to bring the subject before members, Mr. Thompson had prepared a paper and drawings for the meeting, and submitted specimens of defective work, taken from various buildings, by way of illustration. The formation of an Architectural Museum in Melbourne has been under consideration by a committee of the Council. Offers of valuable assistance had been received from leading citizens, and it was hoped that the proposal would soon be realised.

ENGINEERING SOCIETIES.

SOCIETY OF ENGINEERS.—At a meeting of this Soci ty, held at the Royal United Service Institution, Whitehall, on Monday, the 6th inst., Mr. D. B. Butler, President, in the chair, a paper was read on "Railway Surveys and Design in New Countries," by Mr. Percy G. Scott, of which the following is an abstract:—In this paper—which was mainly addressed to the junior members of the Society—the author treated of the location and design of railways in new countries, his remarks being based on personal experience in India and on the Gold Coast. He first discussed the preliminary survey of the line, indicating the instruments, tools, and plant required for the work. He next dealt with the question of labour and the tact required in dealing with it; the means of transport in order to facilitate and expedite work; camps, their selection in regard to the work, and the method of laying them out. Reference was then made to the necessity for carefully studying the physical features and maps of the country through which the line has to pass, and to the importance of making sketches and reconnaissances. Preliminary and detailed survey work was then considered, and the manner of carrying it out for open and mountainous countries was explained. The field work necessary and the method of calculating the waterway for bridges were discussed. The amount of opening to be allowed for culverts and drains, taking into consideration the nature of the country and its effect in influencing floods, was also dealt with. The principal gauges in use on railways in different countries were stated, and the desirability of avoiding a break of gauge wherever practicable was pointed out. The principles underlying the adoption of gradients and curves were stated, and the maximum gradients and minimum curves usually allowable on adhesion railways were given, together with tables showing the maximum gradients and minimum curves on existing railways. The necessary length of straight between reverse curves was pointed out. The author next considered the necessity of showing alternative routes when possible and of giving clearly the advantages and disadvantages of each route with the reasons for finally selecting the line

proposed. He also described the method of staking out the line and of placing marks on the ground in such a way that the line might be readily found and the different points, such as tangent points, intersection points, and bench marks, easily identified. In dealing with plans and sections and designs for works, the method of preparation and the information necessary for the former, were fully given, whilst a brief outline giving the general requirements for the latter were stated. Under the heads of specification and estimates, the author gave instructions as to what is necessary with regard to the general and detailed description of each class, and item of work, when specifying, and he finally indicated the information required for preparing the estimates for sanction.

COMPETITIONS.

LAMBETH TOWN HALL.—At the meeting of Lambeth Borough Council on Thursday of last week a letter was read from the President of the Royal Institute of British Architects, regretting that he was unable to accept the position of assessor in the Town Hall competition, and nominating Mr. Henry T. Hare, F.R.I.B.A. A motion was passed appointing Mr. Hare assessor at a fee of 100 guineas.

SANATORIUM, BARRASFORD.—The plans of Messrs. Nicholson and Dotchin, architects, Newcastle-on-Tyne, have been selected in competition for an open-air sanatorium proposed to be erected at Barrasford, Northumberland, by the Northumberland Branch of the National Association for the Prevention of Consumption. Building operations will be begun without delay, and when completed the building will accommodate 100 patients in separate rooms, together with isolation hospital, etc.

SHEFFIELD WESLEYAN CENTRAL MISSION.—Mr. E. W. Gibbs, the assessor appointed in this competition, states in his report that none of the designs strictly comply with the conditions, and he should therefore by rights exclude them all; "but considering that the conditions in this competition are unusually numerous, covering four pages of printed foolscap, and relate not merely to the drawings, but to complicated questions of light and air, and to the city by-laws and regulations, and that the competitors have apparently endeavoured to comply, and in most cases have probably thought that they have done so, and further, that the designs have been prepared at much cost to the competitors," he recommends the Building Committee to allow him to include the whole of them in his review. The following is Mr. Gibbs's award:—

"Eight of the designs place the large hall above the level of the street, with the small hall and some of the class rooms under it; and one design, No. 6, places the main floor of the large hall below the level of the street, with the small hall in the building behind it and the class rooms above it.

"For a hall in which so large a number as 2,500 persons are to be seated, and at times a larger number are to have standing space, it is clear that the best and only proper arrangement of levels is one in which the floors are partly above the street and partly below, so as to render the entrances easy and the exits as safe as possible in case of panic.

"For this reason alone Design No. 6 takes a high place, but incidentally the adoption of the lower level of large hall, by necessitating the placing of the small hall at the back and the class rooms above it, has made it possible for these rooms to be lofty and perfectly lighted, and this without placing the level of the class room floors at a great height, being 17 ft. 9 in. above the side entrance in Chapel-walk, only 9 in. higher than the floor of the existing church parlour in which the designs are exhibited.

"In the eight other designs, with few exceptions, the halls and rooms on the lower floor are deficient in light. Of course the deficiency is most where the lower story is placed lowest in relation to the street, as in Design No. 2; but that it is inevitable in any design with rooms under the hall is proved by Design No. 5, where the lower floor is a few steps below George-street, the rooms are 20 ft. high, and where, with abundant windows and some skylights, the rays of light passing over the buildings on the other side of Chapel-walk reach only 19 ft. on to the floor, which is inadequate for efficiently lighting a room of 29 ft. depth from window to back wall, much less so for larger rooms as are shown in some of the designs in this position on the lower floor.

"Unfortunately, Design No. 6 shows some minor defects of planning and construction, as more particularly stated in my description of the design, and the architecture is not worthy of so important a building; but I am of opinion that all these defects can be remedied, and would very naturally be so done in the preparation of the working drawings, whereas any one of the other designs would require some amendments in the preparation of the working drawings, and none of them could be so amended as to compare favourably with the general arrangements and levels of No. 6. In making my award I have also to remember that the nature and extent of the accommodation to be provided were not made conditions of the competition, but were merely suggestive. And further, that the object of the competition is to obtain the best building for the special purpose, and that the designs submitted should be judged as suggestive sketches rather than as carefully elaborated working drawings. After very careful and long consideration, I have therefore to award the first premium to No. 6.

"I award the second premium to No. 1, as having the most excellent large hall at a moderate height above the street and excellent general arrangements, except as to height and light of small hall and the large room in basement, and the incomplete arrangement for the use of the large hall for public purposes without interference with the mission work in other parts of the building.

"I award the third premium to Design No. 4, as the large hall is at a moderate height above the street; there is an exceptionally good small hall, with the most excellent arrangement of corridor and class rooms around it, though some of the latter are not sufficiently high and are dull, and the arrangement for separation of large hall for public purposes is incomplete. Further, to my taste, the exterior design of this building is the most excellent of those submitted."

The names of the authors of the premiated designs are as follows:—1st premium, Messrs. Warrington Son and Dunkerley, of Manchester. 2nd premium, Mr. W. J. Hale, Sheffield. 3rd premium, Messrs. Crouch and Butler, Birmingham.

BATHS AT CLAPHAM.—The Baths and Washhouses Committee of Wandsworth Borough Council reported on Monday that they had decided that the proposed baths at Clapham be erected at a cost not exceeding 5,000*l.*, including baths, fitting up, and all other expenses, and that the assessor be informed that the outlay on the proposed building be limited to 4,000*l.* Further, that six architects, experienced in the erection of baths, be invited to submit competitive designs; that the architect whose design is placed first by the assessor be engaged to carry out the building; and that the five other competitors be paid ten guineas each.

HALIFAX SOLDIERS' MEMORIAL.—A meeting of the Halifax Soldiers' Memorial General Committee was held on the 7th inst. at the Town Hall, Halifax, for the purpose of receiving the report of the Designs Sub-Committee on the designs selected six or seven weeks ago. The sub-committee reported that they had referred the three selected designs to Mr. W. S. Frith, of Chelsea, whom they had appointed to act as assessor. He had informed them that the three designs all complied with the requirements set out in the advertisement, and that the one selected for the monument—that marked "Prom"—could be carried out for the stipulated sum of 1,050*l.* It transpired that the author of the selected design, "Prom," is Mr. W. W. Longbottom, architect, of Hipperholme; while the winners of the second and third premiums are Messrs. John Underwood and Son, of London (who sent in the design "*Non sibi sed patriæ*"), and Mr. Alexander F. Smith, of Grange-street, Keighley (whose design was marked "Excelsis No. 1"). Resolutions were passed to pay the successful competitors the premiums of 25*l.*, 15*l.*, and 10*l.* respectively, desiring the sub-committee to instruct Mr. Longbottom to get out specifications and procure tenders for the erection of the monument.

BOOKS RECEIVED

A MANUAL OF FOREST ENGINEERING FOR INDIA. By C. Gilbert Rogers, of Imperial Forest Service of India. (Government Printing Office, Calcutta. 6s.)

The Student's Column.

ARCHES.—XXIII.

THE falseworks employed for the purpose of supporting arches during construction are called *centres* or *centring*. They are temporary structures of timber or steel, and in their design, erection, and subsequent removal the greatest possible care is necessary.

As generally made, centring consists of a series of frames, usually described as ribs, of which the extradosal surface is shaped to correspond with the curve of the soffit of the arch to be built. The ribs are placed parallel to each other at suitable distances apart, in planes perpendicular to the axis of the arch, and are covered with planks, called *laggings*, laid so as to be parallel to the axis of the arch, and forming a sheeting upon which the arch stones or bricks are directly laid.

The most usual type of centring is constructed so that it can be adjusted in position by driving timber wedges below it and the supports, and afterwards lowered or struck by driving out the wedges. Thus the support can be simultaneously removed from every part of the newly-built arch.

In the improved type of centring first introduced by Sir Charles Hartley the lagging was supported upon the ribs by wedges or other devices so that the support could be removed from the arch stones course by course, and restored if it were found that settlement proceeded too rapidly.

The individual frames of centring may be either solid ribs or trusses of timber, but sometimes they are formed by suitably curved steel beams built up of rolled sections and plates.

In trussed timber centring the members upon which the laggings are placed are termed *back-pieces*. The ends of the ribs may be carried by the shoulders of the abutments, or supported by timber struts abutting against baulks laid upon the ground. The erection and manipulation of the centring is a most important part of arch construction, especially in arches of long span, or in the case of viaducts comprising a series of arches. Every change in the form of the centring due to the weight of the materials of the arch ring, is necessarily followed by a change in the form of the arch curve and a corresponding alteration in the position of the line of resistance.

A certain amount of change must obviously be caused in all centring when fully loaded, but given proper strength and stiffness the alteration of form should be so small as to produce very little effect on the stability of the arch. By reference to Article XXI., it will be seen that the depression at the crown of the Plauen viaduct was less than 1 in. in a span of 295 ft., or about $\frac{1}{3540}$th of the span. In this case the centring was of particularly rigid construction, and steps were taken to determine the amount of the depression before the arch ring was finally keyed up. The last-mentioned precaution is not usually taken when small arches are being built, but the method of construction involved is certainly advantageous for all arches of considerable span, as the designer is thus enabled to judge before the completion of his work how far the calculated conditions are being realised.

It should be particularly observed that excessive deformation of the centring, due to inadequate strength, or improper bracing resulting in insufficient stiffness, may involve such alteration in the line of resistance as will endanger the stability of the structure.

Further, the centring must not be struck until the solid backing has been completed and until the mortar has set sufficiently. Moreover, when an arch forms one of a series, none of the centres must be struck in such a manner as to leave any pier with an arch abutting against one side of it, unless the pier is an abutment pier, which has been designed (as explained in Article XVIII., p. 497) so as to permit it to act as an abutment. The disastrous results that may follow the removal of centring before the mortar is thoroughly set are clearly illustrated by the recent collapse of a railway viaduct in Gloucestershire.* The same disaster incidentally exemplifies the effect caused by the unbalanced thrust of an arch against a common pier.

Whatever general method may be adopted in building an arch, the work ought to be so conducted that the work on the centring may never be sensibly unsymmetrical. When building is conducted in the ordinary manner the voussoirs should be laid progressively from both ends. The loading on the centring will thus be increased as the middle is reached, and its maximum effect will be produced when the arch ring has been completely laid with the exception of the keystone.

If no friction existed between the arch stones, the load imposed upon the centring could be exactly determined, but friction between the arch stones, and between them and the centring, makes it impossible to compute the load with any degree of certainty by mathematical formulæ.

It is usual to consider that the voussoirs do not commence to exert pressure against the centring until the work of building has been so far advanced from the springings that the slope of the bed joints is greater than that of the angle of repose, or about 30 deg. In order that this condition may be fulfilled, however, the lower part of the arch must be of such thickness that it will have no tendency to overturn in an inward direction. Rankine considers † that a thickness equal to about one-tenth of the radius of curvature of the intrados is in general sufficient for that purpose,

* The *Builder* Vol. LXXXV., p. 541; Vol. LXXXVI., p. 50.

† "Civil Engineering," p. 486.

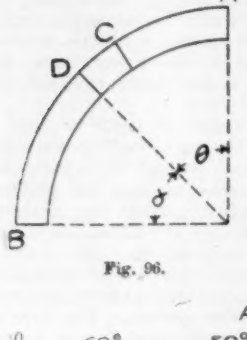


Fig. 96.

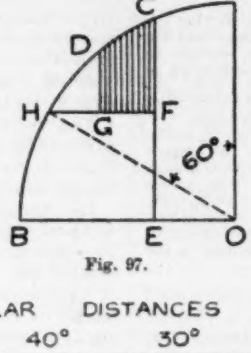


Fig. 97.

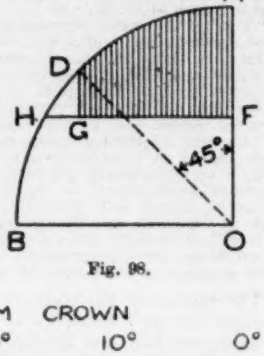


Fig. 98.

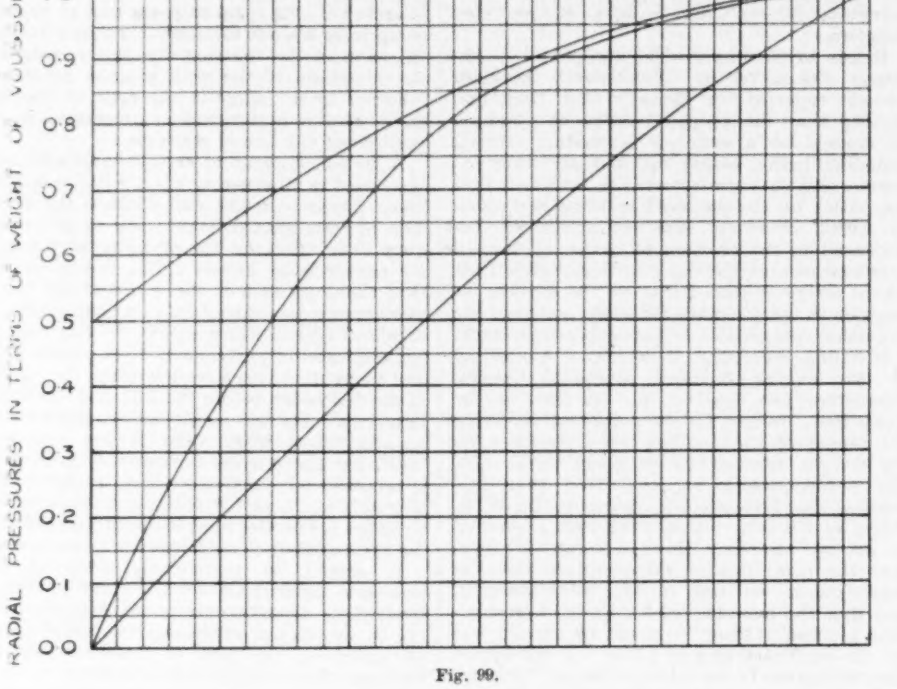


Fig. 99.

but it should be remembered that any accidental disturbance of the arch stones may cause them to exert pressure against the centring.

Every successive course of arch stones laid causes a diminution of the pressure exerted on the centring by preceding courses of the masonry, and, when a semi-circular arch has been completed with the exception of the keystone, the voussoirs whose bed joints have a slope of less than 30 deg. have ceased the pressure against the centring, and this would be true even if there were no friction. As a matter of fact, when the maximum load on the centring has been attained, its action is not materially affected by the presence or absence of friction. Taking this consideration into account, and also the fact that any errors in computation resulting from neglect of friction, must be on the side of safety, it is sufficient for practical purposes to disregard the effect of friction altogether.

As it happens, knowledge of the exact load on the centring is not essential, for the construction is of purely temporary character, and the employment of an excessive amount of timber for the sake of insuring the requisite strength and stiffness does not involve appreciable waste, as the greater part of the material can be again employed for similar purposes. Consequently, the loads may be assumed at a much higher value than their probable amount. Due allowance should also be made for the concentration of materials deposited on the centring to facilitate the work of the arch builders, as well as for shocks and vibrations incidental to the work of erection.

The following rules may be applied for determination of the pressure upon the centring:—

Let a = the angle made with the horizontal by a joint, as D (Fig. 96);
f = the co-efficient of friction of the material;
θ = the angular distance of any point from the crown;
W = the weight of a voussoir, as C D (Fig. 96);
P = the normal pressure on the centring due to a voussoir, as C D (Fig. 96).

Disregarding friction, the voussoir C D in the semi-arch A B (Fig. 96) must evidently be supported by the normal resistance of the surface D and the radial reaction of the centring. The pressure on the surface D is then W cos a, and the pressure in the direction of the radius is W sin a.

Taking friction into account, we find that part of the weight of the voussoirs may be transmitted to the abutment through the arch ring or through the centring. Both of these will offer frictional resistance equal to the product of the perpendicular pressure and the co-efficient of friction, for this co-efficient indicates the friction per unit of pressure perpendicular to the surfaces in contact.

Hence, if the normal pressure on the joint D is W cos a, the frictional resistance is f W cos a. Frictional resistance in the joint D must decrease the pressure on the centring by an equivalent amount, and, taking into account friction on the joint D, the radial pressure on the centring becomes:—

$$P = W (\sin a - f \cos a).$$

But, as the frictional resistance between the voussoir and the centring must decrease the pressure upon the joint D, the value of P, as given by the foregoing equation, cannot be correct. Thus it becomes clear, as stated above, that the effect of friction is to render mathematical determination somewhat uncertain.

By neglecting friction between the voussoirs the radial pressure on the centring is:—

$$P = W \cos \theta.$$

In applying these formulæ to practice it must be borne in mind that friction between the voussoirs is at a minimum at the crown, increasing with the angular distance from the crown, and at 60 deg. from the crown—i.e., 30 deg. from the horizontal—the voussoirs may be regarded as self-supporting. Consequently, the rule P = W cos θ is approximately correct for the crown load, but gives values that are too high for other parts of the curve and the excess of value increases in an increasing ratio with the angular distance from the crown. The rule P = (sin a − f cos a) is similarly correct at the crown, but gives values that are too low for other parts of the curve, and the deficiency of value increases in an increasing ratio with the angular distance from the crown.

In Table XI. we give radial pressures in terms of the weight of the voussoirs, W being taken at unity. The values are calculated by both the above formulæ, for different angles measured from the crown. For office use it would, of course, be convenient to calculate pressures for every degree from 0 deg. to 60 deg. from the crown. For approximate guidance, it may be said the values in column 2 ought certainly to be used between 0 deg. and 30 deg. out from the crown, the values in column 1 may then be applied between 30 deg. and 60 deg. from the crown, and beyond that distance the voussoirs may be considered self-supporting. The adoption of this practice would have the disadvantage that two widely different values are obtained for the angular distance of 30 deg. from the crown, and, bearing in mind the fact that the values in column 1 are too low and those in column 2 too high, it is better to take interpolated values.

The most convenient method for arriving at such is by means of a diagram. Fig. 99 contains three curves, of which two have been plotted from the values in Table XI. The top curve represents the values in column 2, the bottom curve those in column 1, and the middle curve is interpolated so as to give ample values for the first 30 deg. out from the crown, then dropping sharply to meet the bottom curve at 60 deg. Values for any required angle can readily be read off from these curves, and the interpolated values in column 3 of Table XI. have been taken from the middle curve in Fig. 99.

TABLE XI.—RADIAL PRESSURE OF THE VOUSSOIRS ON CENTRING.

Angular Distance from the Crown.	Radial Pressures in Terms of the Weight of the Voussoirs W = 1. Co-efficient of Friction f = 0·58.		
Degrees.	W (sin a − f cos a).	W cos θ.	Interpolation from Curve in Fig. 99.
60	0·000	0·500	0·000
58	0·038	0·529	0·095
56	0·078	0·559	0·175
54	0·118	0·587	0·250
52	0·158	0·615	0·319
50	0·198	0·642	0·384
48	0·238	0·669	0·448
46	0·277	0·694	0·520
44	0·316	0·718	0·556
42	0·355	0·743	0·607
40	0·393	0·766	0·654
38	0·430	0·788	0·703
36	0·458	0·809	0·742
34	0·504	0·829	0·779
32	0·504	0·848	0·809
30	0·576	0·866	0·840
28	0·610	0·882	0·865
26	0·644	0·898	0·880
24	0·677	0·913	0·900
22	0·709	0·927	0·915
20	0·741	0·939	0·927
18	0·771	0·951	0·940
16	0·801	0·961	0·951
14	0·829	0·970	0·962
12	0·857	0·978	0·971
10	0·884	0·984	0·978
8	0·878	0·990	0·985
6	0·931	0·994	0·991
4	0·957	0·997	0·995
2	0·979	0·999	0·998
0	1·000	1·000	1·000
	(1)	(2)	(3)

Each of the values in the column of Table XI. selected for use, when multiplied by the weight of the arch resting on 2 deg. of the centring, gives the radial pressure upon the corresponding part of the centring. Similarly, the pressure upon any longer arc of the centring can be found by taking the sum of the values stated in the selected column for the given arc, and multiplying it by the weight of the arch resting on 2 deg. of the centring.

The following is a graphical method of determining the radial pressure on any arc of the centring of a circular arch:—

Let A B (Fig. 97) be a quadrant described about the point O with the radius O A equal to that of the intrados of the arch. Let C D represent the arc for which it is required to find the load on the centring, and assume that half the radius O A represents w, the weight per foot of intrados.

From the point C draw the line C E parallel to A O, bisect C E, and from F, the point of bisection, draw F H parallel to O B, also draw D G parallel to A O. Then D G will represent the normal pressure p on each lineal foot of the centring at the point D, and the area C D G F will represent the amount and distribution of the vertical component of the load on the centring between C and D.

The point H, being at the angular distance ot 60 deg. from the crown is, that below which the arch stones may be considered as self-supporting.

Again, to find the load on an arc of the centring extending from the crown A to any point D, as in Fig. 98, bisect the radius A O in F and let A F represent w, the weight per foot of intrados. Draw F H parallel to O B, and D G parallel to A O. Then, as before, D G will represent the normal pressure p on each lineal foot of the centring at the point D. The area A D G F will represent the amount and distribution of the vertical component of the load on the centring, and if the springing is situated at D the area A D G F will represent, of course, the entire vertical load on the left half of the centring.

COURT OF COMMON COUNCIL.

THE usual fortnightly meeting of the Court of Common Council was held at the Guildhall on Thursday last week.

On the motion of Mr. A. C. Morton, a report was received from the Streets Committee on the reference of March 24 last in regard to the fire at Duke's Head-passage, Ivy-lane, and as to the promotion of a Bill in Parliament empowering the Corporation to inspect all buildings and require all owners to provide proper means of exit through the roof by fixed ladders and other means of escape. The report stated that the Chairman of the Committees of the House of Lords could not give any hope that the Bill, if introduced, would be allowed to proceed, and the Committee therefore recommended that, under the circumstances, no further action be taken in the matter this Session. After some discussion the recommendation was agreed to. The Committee submitted a list of the posts which have been removed from the public ways with a view of facilitating the work of the Fire Brigade.

The same Committee recommended that the regulations as to the synchronising of clocks in the City be made retrospective, and this was agreed to. It was agreed also to allow a rearrangement of the line of footway in connexion with the improvement in front of Nos. 3 and 4, St. Paul's-churchyard.

A letter was received from the London County Council asking the Corporation to appoint two representatives to attend a Conference of Metropolitan Borough Councils, to be held on July 7 at the County Hall, Spring-gardens, relative to the Public Health (London) Act, 1891. The letter was referred to the City Lands Committee.

Among other correspondence were several communications from various authorities dealing with the Valuation Bill, and a letter from the Clerk to the Conference of Representatives of Local Authorities within the London telephone area, with reference to the proposed purchase by the Government of the National Telephone Company's undertaking, enclosing several resolutions passed at the Conference.

LONDON TRAFFIC COMMISSION.

THE Royal Commission on London Traffic resumed its sittings on Thursday last week, when evidence was given by Sir Homewood Crawford, the City Solicitor, who dealt with the powers possessed by the Corporation in the matter of the regulation of traffic in the City. Referring to the City Police Force the witness stated that, out of a total force of 1,061 officers and men, 266 were told off for traffic regulation in the City. In its capacity as local authority under the Tramways Act, 1870, the Corporation had always successfully resisted the introduction of tramways within the City area. The City was really a huge terminus, rather than a mere highway for through traffic. Owing to its narrow and crowded streets, if the introduction of tramways was permitted, it would be exceeding difficult, if not impossible, to regulate the traffic in the event of a sudden outbreak of fire; and also on occasions of Royal and public processions. Work in connexion with tube railways within the City was always required to be done under the supervision of the City Engineer. The question of the opening of the streets was still on an unsatisfactory footing, and the Corporation felt that full power should be given to deal with the matter.

Mr. Abraham Charles Ellis, General Manager of the Metropolitan Railway Company, was then called. Having outlined the history of the line, he proceeded to deal with the work of electrification now being carried out. The electrification of that railway was being carried out under difficulties which would be absent in the case of a new electric railway. The company's generating station had been built on land at Neasden, adjoining their engineering works. It would be, when completed, the most extensive power station in the kingdom owned by a single railway company. The main building was 318 ft. long by 101 ft. wide. In the engine-room three large turbo-polyphase alternators were being erected, each having a capacity of 3,500 kilowatts, equal to about 14,000 h.p., and capable of supplying 17,000 h.p. to the track during periods of heavy traffic. Provision had been made for the erection of extension units to meet future demands for power, and probably a fourth unit would be installed at once. The steam for driving the alternators would be supplied by ten large tubular boilers, each having a capacity to evaporate 20,000 lb. of water per hour to a steam pressure of 180 lb. per square inch, and also superheated to a total temperature of 520 deg. Fahr. The three-phase alternators would generate directly 11,000 volts across each phase, and at that voltage the current would be transmitted by three-core armoured cables to nine sub-stations on the railway. At the sub-stations the high-voltage current would be transformed by a static transformer to 440 volts, a suitable voltage for the rotary converters, which will convert the alternating current to continuous current for traction use at 600 volts. Positive and negative conductor rails, efficiently insulated, would be used. The new rolling stock would be entirely of English manufacture, and of the open corridor type. The cars would be 52½ ft. long and 8 ft. 9 in. wide, with transverse and longitudinal seats, the entrances being at the ends. So far as possible the cars would be made fireproof, and all precautions would be taken with regard to the electrical apparatus to guard against fire. From the rail level to the waist of the cars the construction would be entirely of metal, the floor being of iron, covered with asbestos, and the underframe and seats and seat supports being of steel. The cars would be encased in steel to the light bottom rail, and a minimum of timber would be used. In the motor-cars the cables would all be carried in Calmon's asbestos slate casings, and no power cables would be carried through the trailer cars. It was proposed to make up trains of six cars, with motor-cars at each end, the combined motors having a normal capacity of 1,200 h.p., and being worked in series and controlled from either end of the train. Each car would be fitted with the Westinghouse brake. The cars would be of two classes, different only in the interior decoration and upholstery. Altogether the company were spending over 1,250,000*l*., which sum would be increased if additional machinery were needed.

On Friday the final sitting of the Commission was held. Evidence was given by Mr. Edgar Speyer, who contradicted certain statements made by the London County Council witnesses with regard to the position of the Underground Company and the various tube lines connected with it.

Mr. Clifton Robinson, the Managing Director and Engineer of the London United Electric Tramways was then called.

Witness dealt at great length with the history of the London United Electric Tramways, from the formation of the company, in 1894, down to the present time. There were now thirty-six route miles in operation; thirty-eight additional miles had been sanctioned, and five further miles passed this Session by a House of Commons' Committee. He then proceeded to a consideration of the present methods of Parliamentary procedure in Private Bill matters, which he regarded as somewhat unsatisfactory. In reply to Sir D. Barbour, he said that he was strongly in favour of the formation of a tribunal to deal with London traffic matters; but such a body was not to be formed hastily. When realised, it should concentrate within itself the best available talent. The number of members should be limited to five, and they should be appointed for a certain number of years, and sit the year round, and not only during the Sessions of Parliament. The special junction of the Tribunal should be to go fully into the details of a proposed scheme, and, by so doing, anticipate a large amount of the technical and routine work now done by the Committees. An inquiry before such a Tribunal should take the place of the veto possessed under Standing Order No. 22; or if this could not be, then some means might be taken by which the enforcement of a Standing Order should rest with the Committee dealing with the Bill. He was not in favour of the London County Council or the Corporation of the City having any exemption from the authority of the new Tribunal.

OBITUARY.

MR. ROYLE.—We have to announce the death of Mr. William Alfred Royle, aged sixty-four years, of 17, Cooper-street, Manchester, and Sparthfield, Heaton Norris, senior and surviving partner of the firm of Messrs. Royle and Bennett, of Manchester. Mr. Royle was elected a Fellow of the Royal Institute of British Architects in 1888, and had served as a representative member of the Council. He was elected President of the Manchester Society of Architects, 1888-9, a member of the Council of that Society in April, 1902, and a Vice-President for the session 1903-4. Of the more important architectural works recently carried out by the firm, we may instance the following:—Warehouses and business premises in Mount and Lloyd streets, Manchester, and the improved approach into Albert-square; the schools in Moston-lane for the Manchester School Board; and the Queen Victoria Memorial Church in St. Luke's parish, Eccles New-road, Weaste. They were architects of many other schools and buildings for the Manchester School Board, comprising the offices in Deansgate and the Higher Grade Schools at Cheetham. Mr. Royle acted as professional adviser and assessor in several important competitions, including those for the Board Schools in Accrington-road, Blackburn; the St. Matthias Schools for the Salford School Board; and, in conjunction with his late partner, the Heaton Norris District Council Public Offices, and the Constabulary Offices at Warrington. Mr. Robert Isaac Bennett, F.R.I.B.A., who was his partner during a long period, died in August, 1901.

MR. JOHN KELLY.—We have to record the death, at the age of sixty-four, of Mr. John Kelly, head of the firm of John Kelly and Son, architects, of London. Mr. Kelly was born in Scarborough, where he received his education, and was articled to a Mr. Petch. He then went to Kington, in Herefordshire, and afterwards to Mr. Taylor's office in Manchester, where he met the late Mr. William Young; but, being ambitious and anxious to come to London, answered an advertisement, and was surprised to find, in reply, that it was from George Edmond Street, whom he served, together with J. D. Sedding, for three years, leaving, however, at the request of Mr. Adams, whom he took into partnership, to start a practice for himself in Leeds, where he obtained his first chance in the form of a church at Hull, which he won in competition. He afterwards became School Board Architect for Leeds, a post which he held for about twenty years, but left to practise in London. Mr. Kelly has done a considerable amount of work throughout the country, including numerous schools, flats, houses, hotels, and over fifty churches, some of the most important being St. Patrick's, Soho-square; St. Patrick's, Leeds; All Saints' Church and Church-room, Petersham; Church of St. Agatha, Kingston-on-Thames; All Saints', South Acton; Emmanuel Church, Leeds; St. Luke's, Kingston-on-Thames; All Hallows, Leeds, etc. The practice will be carried on by his son, Mr. Claude Kelly, who had been in partnership with him.

GENERAL BUILDING NEWS.

IMPROVEMENTS TO THE CATHEDRAL, FERNS, IRELAND.—On the 30th ult. the cathedral at Ferns was dedicated after having been improved and restored. A chancel has been added, and the ceilings, flooring, and seating accommodation have been renovated. The contract for the improvements was carried out by Mr. Webster, of Gorez, from the plans of Mr. J. F. Fuller, architect.

RESTORATION OF ST. CLEER CHURCH, CORNWALL.—The restoration of the parish Church of St. Cleer is being carried out from plans prepared by Mr. Fellowes Prynne, of London. The restoration includes the laying of a floor of Delabole slate on a concrete foundation, and a surface of wood blocks. The aisles will be laid with diamond-shaped slates. The pews, which in the past were of the square box pattern, have been removed, and portions of them are being utilised as a dado around the building. In the restored building chairs will be mainly used. The south wall has been stripped, and will be again plastered, whilst eighteen panels of saints and angels will be introduced. The pillars have been underpinned with a bed of concrete. During the progress of the work several interesting relics have been brought to light. Underneath the old plaster the north wall was found to be covered with texts and frescoes, which were past restoration. In the south wall, near the main entrance, a holy-water stoup was found, and under the plaster at the east end of the same wall an old piscina, filled with stones, amongst which was a gilt alabaster figure, supposed to represent St. Peter in chains, supporting another figure, was discovered. In the south-west wall a portion, on being

removed to make room for a larger window, brought to light the head of a fine old Cornish cross, pierced and beautifully carved. The shaft is missing, but it is intended to find a place for this interesting relic in the church. Remains of an old screen near the chancel have also been discovered, together with several mullions. The woodwork of the approach to a gallery at the west end has also been discovered beneath the plaster. The chancel will continue to be on a higher level than the nave floor, and a new granite step has been placed with a projection for the lectern. Upon this step a carved-wood rood-screen, 10 ft. in height, is to be erected. The roofs over the nave and aisles have been found to be in a good condition, but the nave roof is to be replastered, and the four old clerestory windows taken out, whilst the west end of the roof has been raised so as to show the granite belfry arch. In the chancel roof the pitch-pine ribs are being replaced by oak, and beneath each joint at which the ribs join the wall-plate angels will be placed, with carved bosses where the cross and longitudinal ribs intersect. A Polyphant piscina has been added to the sanctuary, and a new carved oak chancel-arch is to be placed in position. The font has been removed to the west end of the nave, near the belfry. The vestry is to be converted into a Ladye Chapel, for use at weekday services. It is estimated that the cost of restoration will be about 2,000*l*.—*Western Morning News*.

CHURCH, ST. COLUMBA, DRUMCONDRA.—A public meeting was held on the 29th ult. in the new parochial Church of St. Columba, Drumcondra, to receive a report on the work already executed. The outside walls of the aisles on both sides have been completed for some time past, and are ready to receive the roofing timbers as soon as the clerestory walls are a little further advanced. One side of the nave arcade and portion of the other, consisting of plinths, vases, annulets, shafts (in two heights), and caps in selected Portland stone, with heavily-moulded Bath stone arch, are almost completed. The tower, which will reach a height of 76 ft. from the ground line, before the spire will begin, is now built to a height of nearly 60 ft. The church is Romanesque in style. The front doorway is surmounted by arcading, both the doorway and arcading being in Irish limestone. The rose window over the arcading is about 17 ft. in diameter. The turret will, when completed, rise to a total height of 78 ft. The entire external work is carried out in co. Dublin rock-faced granite ashlar in courses, whilst the dressings to doors, windows, and other ornamental portions of the work are in chiselled Irish limestone. The length from the front of the church internally to the face of the apse is 170 ft., whilst the width of the aisles is 65 ft. 6 in., the width across the transepts is 102 ft. 6 in., and the height from floor to ridge will be 64 ft. The entire work has been carried out by Messrs. William Conolly and Son, of Dublin, from designs prepared by Messrs. Ashlin and Coleman, architects, Dublin, under whose supervision the work is progressing.

CHURCH, INCHINNAN, N.B.—The memorial stone of the new Parish Church of All Hallows was laid at Inchinnan recently. The new church consists of a nave, with north porch and north and south transepts, vestry, etc., and is built of grey stone from Grange Quarry, Blackpasture, Northumberland, and Whitespot Quarry. The nave, which measures 71 ft. long by 39 ft. wide, is about 38 ft. high to the apex, with an open roof. It is lit from the sides by nine two-light traceried windows. The walls are panelled with work to a height of 5 ft. 6 in., and above that they are lined with red Hampshire bricks with bands of stone at intervals. From the crossing of the nave and transepts rises a square tower. It is carried on heavy stone piers, and through these the stone vaulting rises to a height of about 37 ft. from the floor. A circular aperture is left in the space through which bells may be elevated into the belfry. The tower has only been carried to the belfry stage at present, the completed design showing a high-crowned steeple. The cost of the work carried out so far will, it is estimated, be not less than 20,000*l*. The architect is Dr. Rowand Anderson, Edinburgh.

NEW CHURCH, BLACKHALL, N.B.—The Church of St. Columba, Blackhall, was recently dedicated. The building stands on a site on the Queensferry-road, near Craigleith. When completed it will accommodate 900 persons, and will have large halls, vestries, etc., attached. The portion completed at present consists of the nave and apse, with the north aisle and chapel, and the lower stages of the tower. The cost will be about 5,000*l*. The work is Norman in style; the interior is of dressed white stone, and the roofs are of timber, open to the ridges. The architect was Mr. P. Macgregor Chalmers, Glasgow.

PRESBYTERIAN CHURCH, HOVE.—The newest addition to the places of worship in Hove is the Presbyterian Church of England Hall, at the corner of Holland-road and Cromwell-road. The large hall and class-rooms are now practically finished, and the erection of the church proper will be commenced when the accommodation for worshippers in the large hall becomes inadequate. The cost of the completed buildings is 4,500*l*., while the total cost of the church and halls will be about 10,000*l*. The building is of red brick with stone facings, and is in the Early Gothic style. There are two floors, the large hall in which it is proposed to hold services being on the upper floor. Its dimensions are 50 ft. by 30 ft., and it is capable of seating 250 people. At the rear of the hall are a committee-room and vestries. On the under floor is a smaller hall, 30 ft. by 27 ft., which will seat 100 persons, and there are also class-rooms, cloak-rooms, kitchen, lavatories, etc. The architect is Mr. Henman, of Croydon, while the builders are Messrs. W. A. Field and Co., Brighton.

NEW METHODIST FREE CHURCH, SOUTH SHIELDS.—The foundation-stone of the proposed Methodist Free Church and school-rooms, at Westoe, South Shields, was recently laid. The new buildings will be erected on a site at the corner of Birchington-avenue and Oxford-street, and the entrance to the church will be from the latter street. The buildings will comprise vestries, classrooms, and a large hall, to be used for Sunday school purposes, the entrance to which will be in Birchington-avenue. The total sitting accommodation in the church will be for 420 persons, and the schoolrooms will accommodate 400. The total cost of the work, exclusive of the site, will be 4,200*l*. The contractors are Messrs. W. J. Robertson and Sons, and the architect Mr. Geo. Smith, of South Shields.

CEMETERY CHAPEL, CROMER.—A chapel has been erected in the cemetery at Cromer, from the designs of Mr. A. F. Scott, architect, of Norwich and Cromer. The building is in the Early English style, and is built of red brick, with Ancaster stone. The covered entrance is surmounted by a tower. The interior shows a pitch-pine roof, mosaic floor, and oak seating. The chancel is arched, and has two doors, one leading into the vestry, and the other opening on to the drive outside. The windows are lead-glazed throughout. Mr. B. Porter, of Cromer, was the contractor.

WESLEYAN CHURCH, BEAMISH, NORTHUMBERLAND.—The opening of the new Wesleyan Church at Beamish took place recently. The new structure accommodates 450 persons. Alterations have also taken place in the old church, which has been converted into a school hall. The exterior design is Early English in character, and is executed in stone. The interior fittings are of pitch-pine, stained and varnished. The contract has been carried out by Mr. William Hall, Bensham, Gateshead, who has also supplied the seating; the leaded glass by Messrs. Thompson and Snee, Gateshead; and the heating and gas fittings by Messrs. J. Rowell and Co., Newcastle. The plans were selected in competition, Messrs. Marshall and Tweedy's designs being chosen, and under their supervision the works have been carried out.

NEW METHODIST CHURCH, BIRMINGHAM.—The Methodist New Connexion Church in Dudley-road, Birmingham, was opened recently. The style of the new building is Early English. There is a spire at the side of the church rising to a height of 75 ft. The outside is faced with selected red bricks and terra-cotta dressings, and the inside is of rough stucco plaster which can be afterwards decorated, and of terra-cotta arches and dressings. The body of the church has been so designed that there are no pillars. At the Dudley-road end is a small gallery, which only projects a few feet over the body of the church. The pulpit and rostrum are of blue York stone, and the pulpit has a carved stone front and balustrade, supported on marble columns with carved stone caps. At the back of the rostrum, divided by a low, pitch-pine screen is the choir, which is arranged with sloping seats facing the congregation, and at the back of this is a mullioned window with leaded lights. The organ-chamber is arranged on the left of the church at the side of the choir. There is accommodation for about 500 persons, and the total cost of the building is a little over 4,000*l*. The architect is Mr. J. G. Dunn.

NEW PRIMITIVE METHODIST CHAPEL, WINFARTHING, NEAR DISS.—The foundation-stones of a new Primitive Methodist chapel at Winfarthing, near Diss, were laid recently. The plans for the new building were prepared by Mr. H. Winkworth, Ipswich, and the contractor is Mr. Eldon J. Smith, of Bunwell. The contract price of the new building is 225*l*., and the seating capacity will be from eighty to 100 worshippers.

PARISH HALL, PRUDHOE, NORTHUMBERLAND.—The opening of the new Parish Hall, at Prudhoe, took place recently. The building has been erected on a site on the main road, and adjoins the vicarage and church. It is a one-story building, and contains a hall, and there are two anti-rooms near the entrance, together with a kitchen and committee-room. The total cost of the building, including furnishing, was 1,600*l*., and the architect was Mr. S. D. Robins, Newcastle and Sunderland, whilst the contractors were Messrs. G. Watson and Sons, Stocksfield. The plumbing and heating had been executed by W. Scott and Sons, Newcastle and Jarrow, and the painting and glazing by Watson and Charlton, Stocksfield.

WESLEYAN SCHOOL-CHAPEL, KNOWLE, BRISTOL.—The memorial stones of a new Wesleyan school-chapel were laid at Upper Knowle on the 1st inst. A church with tower and spire, and accommodation for 700 persons, besides a lecture hall, vestries, etc., are included in the complete scheme. On the building at present being erected are comprised a school-chapel, 50 ft. by an average of 40 ft., with transepts available for use as class-rooms; also an infant school, a church parlour (capable of division into two class-rooms), and four other class-rooms. Provision will also be made for tea meetings, library, etc. In the school-chapel there will be accommodation to seat 250 adults. The buildings are being erected in pennant stone with Bath stone dressings, and the roofs will be covered with red Broseley tiles. The architects are Messrs. La Trobe and Weston, and the builder is Mr. C. A. Hayes.

WESLEYAN SCHOOL-HOUSE, BENTON, NORTHUMBERLAND.—The foundation-stones of the new Wesleyan school-house in Forest Hall-road, Benton, were laid recently. The building, which is capable of accommodating 250 persons, will have three vestries on the ground floor, and meeting-room and other vestries on first floor, with cloak-rooms, etc. The buildings are to be built of stone, and the architects are Messrs. Marshall and Tweedy, Newcastle, whose designs were selected in competition. Mr. Rowell, contractor, Newcastle, carried out the work.

SPINNING MILL, PRESTON.—It is proposed to erect a new spinning mill on the Knowles estate, off New Hall-lane, Preston. The plans for the building have been prepared by Messrs. Potts, Son, and Hennings, architects, Bolton. Provision will be made for 100,000 spindles, and the cost will work out at about 22*s.* 6*d.* per spindle.

EXTENSIONS TO BUSINESS PREMISES, BELFAST.—The alterations and extensions of the premises of Messrs. W. W. Cleland, Ltd., in Durham-street, Belfast, have now been completed. Mr. William Gabbery, builder, carried out the work under the supervision of the architect, Mr. W. J. Fennell.

REHOUSING IN ST. PANCRAS.—On Saturday last week a number of residents of St. Pancras and others paid a visit of inspection to Goldington-buildings, the latest addition to the blocks of working men's flats in the north-western part of the metropolis. The foundation-stone of the building was laid by a former Mayor of St. Pancras, Alderman Barnes. Mr. K. D. Young was the architect, and Messrs. Whitehead and Co. were the builders. The building consists of five stories.

STAINED GLASS AND DECORATION.

MEMORIAL WINDOW, OVINGHAM, NORTHUMBERLAND.—Stained-glass windows have been placed in the Ovingham Parish Church and in St. Oswin's Church, Wylam, in memory of Mr. Richard Clayton. The designs were prepared by Messrs. Clayton and Bell, of London.

SANITARY AND ENGINEERING NEWS.

GLASGOW DRAINAGE SCHEME.—The sewage works at Dalmuir erected by Glasgow Corporation in connexion with the drainage scheme for the western district of the city, and the adjoining burghs of Partick and Clydebank, were opened on the 31st ult. The works represent an expenditure of about a million sterling. They are situated on the north bank of the Clyde, at the western limit of the "long town" formed by Yoker, Clydebank, and Dalmuir, and over nine miles from the centre of the city. The centrifugal pumping plant required to raise the sewage consists of two compound engines, each capable of lifting 4,200 gallons per minute through a net height of 20 ft., and one triple-compound engine capable of raising 9,000 gallons per minute through a similar height. The electrical power and distribution plant consists of two direct driven steam dynamos, each capable of delivering 300 h.p., and one similar generator capable of delivering 150 h.p. These engines, together with the centrifugal pumping engines, are connected to two independent direct steam-

driven surface condensing plants. The boiler plant consists of four Lancashire boilers, 7 ft. 6 in. by 30 ft., suited to a daily working pressure of 160 lb. per sq. in., and fitted with mechanical stoking plant and fuel economiser. The boiler auxiliary consists of independent steam pumps and feed water filters and coal elevator and conveying plant. The works are electrically driven, current being supplied at 230 volts at the switchboard, and distributed to the various motors throughout the works for driving the screen gear, elevating machinery, auxiliary pumps, lime-mixers, and the workshop plant. In addition, power is distributed to the sludge pumping plant situated at the south end of the precipitation tanks. The sewage treatment machinery embraces rough and fine screens through which the sewage passes on its way to the catch-pit, a travelling dredger for dealing with the heavy deposit in the catch-pit, revolving lime-mixers and travelling lime-mixers for the preparation of milk of lime, and oxidisers for the preparation of iron liquor. A water tank is provided on the roof of the power-house annexe, from which a supply of Corporation or burn water may be drawn. The main sludge tanks to the south of the precipitation tanks are each 150 ft. long by 35 ft. wide, by 10 ft. 3 in. total inside depth, built in combination with mid-division common to both. Each tank has a capacity of 1,470 tons of undrained sludge, and they are erected on a sub-structure of brickwork. The sludge is discharged from the precipitation tanks to the pump well under the pump-house immediately east of the main tank. From this well the sludge is raised by three direct motor-driven centrifugal sludge pumps, each capable of raising 1,500 gallons of undrained sludge per minute. These pumps are placed in the pump-house immediately over the pump well, and in this house are also placed the auxiliary motor-driven exhausters and the electrical switchboard. From the tanks the sludge is drawn off through large pipes to the wharf, where are placed the sludge loading pipes. These loading pipes have swivelling arms, suspended from a gallows on the wharf, and are capable of being lowered out over the deck of the sludge steamer, permitting the sludge to be discharged by gravity from the sludge tanks into the sludge steamer hold. The mechanical equipment of the station was carried out, from the designs of Mr. D. H. Morton, engineer, Glasgow, by Messrs. D. Stewart and Co., Ltd., Glasgow.

SEWERAGE SCHEME, GREYSTONES, IRELAND.—The Local Government Board has sanctioned the proposed sewerage scheme at Greystones. The scheme has been prepared by Mr. J. H. Ryan, M.Inst.C.E., and Mr. R. M. Butler, M.Inst.C.E., both of Dublin. The septic tank is the system adopted.

WATERWORKS, LYNTON.—The new waterworks at Lynton were opened recently. The intake is at Cherribridge, 70 ft. higher than the old reservoir in Station-hill, and there the water passes through a screening chamber where all coarse suspended matter is kept back. Thence the water is conveyed in 8-in. cast-iron pipes to Lynton, where the new main is connected direct to the old service mains. One hundred yards from the intake is a filter-house, in which is a battery of automatic compressed air and oxidising water filters. This method of filtration only requires a ground space of 40 sq. yds. The scheme has been carried out from the plans of Mr. W. H. Chowins, Surveyor to the Board, at a cost of 2,500*l*.

FOREIGN.

FRANCE.—The late M. Léon Dru, the engineer, has left to the State the historic Château of Vez, with its art collections, on the condition that this fine architectural monument is scheduled among the Monuments Historiques. The testator has left 40,000 francs in *rentes* for keeping up the Château, and M. Boeswilwald has been appointed as architect in charge of the work.——A sum of 160,000 francs has been voted for the improvement of the port of St. Valéry-sur-Somme——A considerable portion of the ancient Château of Pierrefort has been destroyed by fire.——The municipal authorities of Mentone have decided on the creation of an art museum in the town.——The ancient Church of St. Lo is to be restored under the direction of M. de la Roque, architect. The vaulting is in a dangerous state.——The jury of the Ecole des Beaux-Arts for the architectural competition of the first class has awarded "premières medailles" to M. Aubin and M. Roze, pupils of M. Laloux, and to M. Guyon, pupil of M. Paulin.——A new post and telegraph office is to be built at Besançon, from the designs of M. Maurice Forien.——The Chamber of Deputies has voted a sum of 15,000,000 francs for the construction of a railway from Tananarive to the coast of Madagascar.——The "Société Historique" of Auteuil and Passy has opened, in the lecture-room of the Guimet Museum, its first historical and archæological exhibition.——The monument by M. Lenoir to the composer César Franck is to be inaugurated shortly in the square of Ste Clothilde, Paris, and a statue of Bernardin St. Pierre is to be erected in the Jardin des Plantes.——The death is announced, at the age of fifty-three, of M. Henri Champion, assistant "architecte-voyer" to he Municipality of Paris. He was a member of the Société Centrale, and architect of works of some interest both in Paris and in the provinces.

UNITED STATES.—The Quarterly Bulletin of the American Institute of Architects (dated "January," but which has only just reached us) records that at the meeting of the Board of Directors in January, the secretary read a communication from Mr. McKim, on the construction of the new buildings for the Agricultural Department, and the new National Museum on the Mall. As this is a part of the proposed scheme laid out by the Park Commission, it was thought necessary that some action should be taken so as to secure uniform grades and sky line that would be in harmony with each other and also with the future development of Washington. After discussing the importance of this feature of the future development of Washington, Mr. C. F. McKim was appointed chairman of the committee, with power to select his associates, and to take such action as he thought best towards securing some form of Government censorship which would assure these buildings being erected in harmony with the proposed improvement of Washington.——It has been decided to ho... the next convention of the American Institute of Architects in Washington, in the early part of the month of December next. It was also determined, upon a motion of Mr. Geo. B. Post, that a special social meeting should be held in St. Louis, at such time and under such circumstances as the President of the Institute should elect: it was determined that the most advantageous time would be during the month of June of this year.

ROUMANIA.—There are now being erected in the town of Constantza, at a cost of about 20,000*l*., law courts, an official residence for the prefect, and a royal villa. The municipal authorities intend to spend 12,000*l*. on the construction of a casino this year, and also to erect iron buildings for a market. Other schemes for the improvement of the town are under consideration, including the paving of the principal streets with granite and a partial system of drainage.

DENMARK.—It is announced in the *Moniteur Officiel du Commerce* that the Danish Government is inviting tenders for the reconstruction of the Castle of Kristiansborg, the ancient palace of the Kings of Denmark. The cost of the work will probably amount to over 330,000*l*. It is also stated that the Danish State Railways will shortly invite tenders for the construction at Copenhagen of a central workshop for machinery, at a cost of about 178,000*l*., and of a central station at Copenhagen, at a cost of 1,000,000*l*.

MISCELLANEOUS.

PROFESSIONAL AND BUSINESS ANNOUNCEMENTS.—The office of the District Surveyor for South Islington, Shoreditch, and Norton Folgate, has been removed to No. 169, High-street, Shoreditch, E.

ADVERTISEMENT HOARDINGS.—The Islington Borough Council considered at their meeting on Friday of last week a circular letter from the Royal Institute of British Architects, directing attention to the abuse of buildings by advertisement hoardings, and urging the importance of some control by public authorities over such advertisements. The Parliamentary and General Purposes Committee presented a report to the effect that they were of opinion that, in some instances, advertisements were placed in positions detrimental to surrounding property, and so as to be a disfigurement to the streets. The following motion was passed:—"That the London County Council be requested to consider the desirability of making a by-law, or taking such other steps as they may deem advisable to regulate advertisement hoardings upon buildings having a frontage to any street or public place in the metropolis."

QUEEN VICTORIA MEMORIAL, IPSWICH.—The unveiling of the statue of Queen Victoria, which has been placed in Christchurch Park, Ipswich, took place recently. The figure is 9 ft. in height, and represents the late Queen at about the age of thirty years. Mr. Herbert Hampton was the sculptor for the work.

BUILDERS' FEDERATION MEETING AT NEWPORT.—The quarterly meeting of the South Wales Building Trades Employers' Federation was held at the King's Head Hotel, Newport. Mr. Blackburn (Newport) reported having attended the committee meeting, composed of the master builders and master plasterers, held at Derby, where working rules were drawn up, which were accepted by the Plasterers' Society. A discussion arose as to the practice of sending in priced bills of quantities with tenders, and it was decided to refer the question back to the different associations. It was decided that the next meeting be held at Pontypridd. At the annual meeting of the Federation, the following officials were elected for the ensuing year:—President and chairman, Mr. Watkin Williams, Pontypridd; senior vice-president, Mr. W. T. Morgan, Cardiff; junior vice-president, Mr. W. A. Linton, Newport; treasurer, Mr. W. Thomas, Cardiff; auditors, Mr. W. O. Jenkins, Swansea, and Mr. T. James, Pontypridd; and secretary, Mr. W. H. Billings, Swansea. The retiring chairman (Mr. B. Bennett) was thanked for his services.

HAREFIELD LIME AND WHITING WORKS.—At the Mart, Tokenhouse-yard, City, on June 8, Messrs. Humbert and Flint submitted to auction (in consequence of a dissolution of partnership), as a going concern, the Harefield Lime and Whiting Works, Middlesex, including the goodwill. The premises are situate three and a half miles from Rickmansworth Station, on the Metropolitan Railway, and possess a canal frontage of about a quarter of a mile to the Grand Junction Canal, with shoots for lading, which, the auctioneers pointed out, afford exceptional facilities for supplying chalk to the "stock" brickfields from Cowley to Slough, West Drayton, Southall, etc., and in direct communication with Paddington. The portion of the property used for the lime and whiting works includes an area of 24a. 3r., containing extensive deposits of chalk, flints, gravel, sand, and hoggin; there is a chalk cliff, with a facing of nearly a quarter of a mile, and attaining a height of about 130 ft. The buildings comprise a dwelling-house, four cottages for labourers, van shed, stabling, three domed lime kilns, two open and continuous lime kilns, large whiting drying shed, engine shed, with 6 h.p. portable engine, driving two grinding mills, and an engine-house having a deep artesian well, with draw pump, and fitted with 25 h.p. oil-engine, driving the large chalk mill for whiting grinding. This portion of the property is leasehold, for a term of about thirty-nine years unexpired, at 180*l*. to 190*l*. per annum. The brickfields embrace an area of about 19a. 0r. 2p., with an abundant supply of brick earth, which makes both red and stocks, two new Scotch kilns, each holding 50,000 bricks, four large settling backs for washed clay, brick burner's hut, sand-house, three pug mills, and clay wash mill, etc. This portion is held under a grant of lease and licence to dig, cart, and carry away on to the premises, comprised in the lease before-mentioned, clay for the purpose of making bricks or cement, for a term to run concurrently with the lease of the lime works, the grantee paying a royalty of 2*s*. per 1,000 for all bricks made, and an additional royalty of 1*s*. per square yard for every yard of clay used for the manufacture of cement. The sale of bricks was guaranteed to average 500,000 in every year of the tenancy. The whole of the fixed machinery and trade requisites, with 100 tons of metal rails, barrows, etc., were to be included in the sale, and possession to be given on completion of the purchase; the vans, horses, and other movable effects to be taken by the purchaser at a valuation. Although there was a good attendance in the auction room, no bid was forthcoming, and the lot was accordingly passed, with an intimation that the vendors were prepared to sell by private treaty.

THE SANITARY INSTITUTE.—At an examination in Practical Sanitary Science, held at Manchester, on June 3 and 4, three candidates presented themselves, and one candidate, Mr. Cecil H. Norton (Worcester), was awarded a certificate.

Legal.

ANCIENT LIGHT DISPUTE.

THE case of Abbott and Sharland *v.* Holloway, Whiddington, and Turner came before Mr. Justice Buckley in the Chancery Division on the 1st and 2nd insts.

This was an action for an injunction to restrain the defendants, their servants, agents, and workmen, from erecting any building or other erection upon the site of Nos. 19 and 20, Ham-yard, Great Windmill-street, so or in such manner as to obstruct the ancient lights of the plaintiffs' premises, No. 39, Great Windmill-street, as such lights were enjoyed prior to the recent demolition of the old buildings at Nos. 19 and 20, Ham-yard, and for a mandatory injunction, and damages,

Mr. Buckmaster, K.C., and Mr. Maughan appeared for the plaintiffs; and Mr. Astbury, K.C., and Mr. Cozens Hardy for the defendants.

Mr. Buckmaster, in opening the case, said the plaintiffs were the freeholders of 39, Great Windmill-street, the defendant Turner was the freeholder of the property which was formerly known as Nos. 19 and 20, Ham-yard, the defendant Holloway was the builder engaged under the terms of a building contract on the site of 19 and 20, Ham-yard, and the defendant Whiddington was the architect engaged on the scheme. The action was brought for an injunction to restrain the erection of a building on the site of Nos. 19 and 20, Ham-yard in such a manner as to affect the lights which were enjoyed by the plaintiffs' premises before the property which stood on Nos. 19 and 20, Ham-yard was pulled down. The recent decision in the House of Lords to some extent modified the course the Courts had taken in such matters. But he was in a position to establish that the building which it was proposed to erect would occasion a very serious nuisance to the plaintiffs' property. The old buildings in Ham-yard were about 30 ft. high, and at a distance of 25 ft. from the plaintiffs' buildings. The proposed new building was to go to a height of 63 ft. He had no doubt that the premises to be erected by the defendants would darken his clients' premises, and a serious wrong would exist. Some of the windows would nearly lose their light altogether.

In answer to his lordship, Mr. Astbury said he did not deny that there was an obstruction of the plaintiffs' light; but the question was whether there should be an injunction or damages. His defence could be embodied under three points—viz., (1) since the case of Colls this building of defendants came under the designation of a big town improvement; (2) that if it had not been for the fact that they had purchased the rights of No. 18, the building to be erected would not in any way affect the plaintiffs' premises; and (3) even when the defendants' building was erected the plaintiffs would enjoy a direct south-west light.

Mr. Buckmaster said that to his mind the question was whether or no what defendants were going to do created a legal nuisance to the plaintiffs which entitled them to an injunction.

Mr. Astbury said he should argue that there would have been no right of action if No. 18 had not been there. His clients' building would have no material effect on the plaintiffs' building. If there was an actionable wrong, then he should say it was so trifling that damages would meet the cast. He did not dispute that the plaintiffs' lights were ancient.

The first witness called was Mr. A. O. Collard, architect. He said he had examined the plaintiffs' premises, and had been informed of the probable height of the defendants' building. In his opinion, the defendants' proposed building would very largely interfere with plaintiffs' light and cause a nuisance.

Mr. E. B. I'Anson, an architect and surveyor, said he had visited the *locus in quo*, and had formed the opinion that defendants' building would materially affect the light coming to the plaintiffs' premises, and a nuisance would be created.

Cross-examined,

In his opinion the defendants' building would very materially interfere with the effective light of plaintiffs' windows.

Mr. Douglas Young, F.S.I., one of the valuers to the Board of Trade, said that in his opinion the value of the plaintiffs' property by reason of the obstruction of light would be depreciated by 600*l*. He also thought that the letting and selling value of the property would be affected.

Other evidence having been given,

The first witness for the defence was Mr. E. A. Gruning, architect and surveyor, who said if No. 18, Ham-yard were pulled down to its original height, and Nos. 19 and 20 were raised, this would not create a nuisance to the plaintiffs' house. To his mind, ample light would remain for all reasonable purposes. In his opinion, the ground value of plaintiffs' premises was being increased by the erection of the defendants' buildings and the general improvement in the neighbourhood.

Mr. Wm. Whiddington, architect and surveyor, gave evidence of a corroborative nature.

Mr. Henry Hall, an architect, said he was architect for 18, Ham-yard when it was rebuilt, and the owners of the plaintiffs' premises then received 75*l*. for allowing the building to go to a certain height.

When the case was resumed on Thursday morning, his lordship said, on his way to Court, he had viewed the premises, and he should like Mr. Buckmaster to consider the offer made by the defendants some time since.

A consultation took place between counsel, and eventually Mr. Buckmaster said there had been an offer made by the defendants to pay their taxed costs and leave his lordship to say what amount of damages the defendants should pay the plaintiffs.

His lordship said his intention was to send the matter to a surveyor to say if any damage at all had been done by the defendants. No doubt some light would be taken from the plaintiffs' building by the defendants' buildings; but the question was whether the light taken away was sufficient to cause a nuisance and so entitle the plaintiffs to damages.

Mr. Buckmaster said he regretted that they could not agree upon the amount of damages, and they would agree to an independent surveyor assessing them.

His lordship said there would be a consent order by which the defendants paid the taxed costs and each side paid half the surveyor's fees. The question he should put to the surveyor was whether the erection of defendants' building, having regard to the increased benefit thereof, would depreciate to any, and what, extent the value of the plaintiffs' premises.

Mr. Buckmaster and Mr. Cozens Hardy assented.

His lordship: I understand that the defendants are prepared to abide by whatever the surveyor may find.

Mr. Cozens Hardy: Yes.

His lordship made the order accordingly, he to appoint a surveyor, failing an agreement between the solicitors and parties.

ACTION BY A SURVEYOR.

THE case of Golds *v.* the Frinton-on-Sea Urban District Council came before Mr. Justice Farwell, sitting as an additional Judge of the King's Bench Division, on the 2nd inst.

This was an action by Mr. T. W. Golds against the defendants to recover 269*l*. 9s., which he alleged to be due to him for salary and for services rendered and work done.

Mr. T. W. Wheeler, K.C., and Mr. Hudson appeared for the plaintiff; and Mr. F. Low, K.C., and Mr. George Elliott for the defendants.

The plaintiff, in his claim, set forth that the amount he sued for was in respect of his salary as surveyor, salary as inspector of nuisances, visiting and examining drain connexions, and making surveys, and superintendence of works at the Esplanade and at Hadleigh-road.

Defendants admitted the plaintiff's claim for certain sums, but they claimed to be entitled to deduct an amount for road-making expenses in respect of plaintiff's house in the Hadleigh-road. As to the Esplanade work, defendants denied that there was any agreement to pay the sum claimed by way of commission or otherwise, but said that if any such agreement was made, it was not made in accordance with the provisions of the Public Health Act, 1875. Defendants also alternatively said that if any such agreement was made, it was that the plaintiff should have a commission on only such part of the cost of the works as should be contributed to by private owners.

After hearing counsel and the evidence, his lordship dismissed the action. He said the question to be decided was whether the plaintiff was entitled to receive an extra sum in respect of the contract for the Esplanade work. So long as the plaintiff was surveyor, he was bound to do all the surveyor's work for his salary. If he was to get extra salary for doing extra work, that would be a contract which would have to be proved, and if it exceeded 50*l*. it would have to be under seal. But there was no contract, and, in his opinion, the action failed.

Mr. Elliott stated that the defendants had paid a certain sum into court.

His lordship said that the plaintiff would have the payment out of court of the amount of his salary, and the sums admitted by the defendants to be due to him, with the costs up to the time of the payment into court, the balance to be paid to the defendants with costs from that date.

PATENTS OF THE WEEK.

APPLICATIONS PUBLISHED.*

10,640 of 1903.—H. NEWTON: *Wash Boilers, Coppers, Boiling Pans, and like vessels.*

According to this invention, a wash boiler or copper may be cast with, or otherwise provided with, a central, or otherwise disposed, division or partition for the purpose of facilitating the washing of the clothes by enabling one compartment to be used to boil one portion of the clothes, such as the fine white or linen clothes, whilst the other compartment is used to boil another portion of the clothes, such as the coarse greys or calicoes. Or one compartment may be used to boil one portion of the clothes being washed, whilst the other is used to secure a supply of clean boiling water ready for use.

10,700 of 1903.—G. F. LYMAN, P. S. STEPHENSON, and A. B. TAYLOR: *Devices to Prevent Rattling in Windows.*

A device consisting in the combination of a spring arm, having its lower end bent at substantially right angles to the main body thereof, a locking device engaging said lower end, connexions intermediate said arm and said locking device, and a roller carried by the free end of the spring arm.

11,120 of 1903.—E. PHILLIPS: *Lifts, Elevators, and Hoists.*

Lift operating gear, comprising a shaft carrying a worm at each end, a drum-shaft at each side of the lift carrying worm wheels gearing with the said worms, ropes or chains at the sides of the lift connected to the platform or cage and running on to winding drums on the drum-shaft, pulleys at each side of the lift, and ropes or chains running over the pulleys and connecting with counterweights.

11,146 of 1903.—R. BLAIR and B. W. GONIN: *Wood-working Machines.*

Wood-working machines, consisting in the combination with permanently-fixed vertical lower side-frames, vertically-adjustable upper side frames, recesses in the horizontal edges of said side frames, bearings capable of limited vertical adjustment disposed within said recesses, vertical retaining grooves in said bearings, retaining caps for said bearings, driven spindles mounted in said bearings, driving-belt pulleys rigidly mounted on the ends of said spindles, and driving rollers centrally-mounted on said spindles.

11,470 of 1903.—J. CALLIE: *Windows.*

This relates to windows, and consists in carrying a swivelling window by means of a pair of pins attached to the window, and carried in bearings in the sash, so as to be capable of axial and angular movement therein, the lower pin being adapted to be raised and lowered by a cam, which locks the said lower pin against axial movement in its upper and lower positions.

11,503 of 1903.—A. E. RICKABY: *Appliances for Supporting Shelves, and other devices, in Shop Window Dressing, and other like purposes.*

A standard or bar shaped with notches and recesses, and a sleeve or socket with projections on the inside, this sleeve or socket shaped so that the projections in same engage the complementary recesses in the standard or bar, and thereby fix the sleeve or socket at any required point, or by a motion to disengage the said notches and projections, and so allow the sleeve or socket to travel up or down the standard or bar.

14,809 of 1903.—R. ADAMS: *Door Springs and Checks.*

A door-closing appliance, consisting in the combination with a pivot and one or more pins, studs, rollers, or the like, engaging a recessed or toothed bar, a spring or springs of the helical or spiral type, so mounted between said door and a fence-plate, or equivalent abutment, as to enable the lateral resilience of said springs to be utilised as well as the axial-compression power thereof.

15,117 of 1903.—M. HELLIWELL: *Cowls for Chimney and Ventilating Shafts.*

This invention relates to cowls for preventing down draught in chimneys, and the like. In carrying out the invention, a vertical spindle is secured in a convenient manner at the top of a chimney, or like shaft, and upon the point of said spindle is mounted a cowl of triangular shape in one vertical direction, and square, circular, or other convenient shape in the other vertical direction, the bottom of the cowl being open, and the inclined plate forming the top of cowl of such length as to extend below and protect the top of chimney, or the like opening.

16,815 of 1903.—H. BRANGET: *Apparatus for Separating or Grading Ground or Pulverised Materials.*

Apparatus for separating pulverised material, comprising a closed casing, and consists in the combination of a fixed, inclined cylinder, means for delivering thereto materials to be sorted, a shaft mounted axially in the cylinder, means for rotating the shaft, a structure for stirring up the contents of the cylinder carried on the shaft and rotated therewith, a screw fin for advancing the materials within the cylinder, and means for furnishing an air blast in a direction opposite to the advance of the material.

* All these applications are in the stage in which opposition to the grant of Patents upon them can be made.

18,211 of 1903.—G. WATSON: *Construction of Destructor, and other Furnace Arches and Crowns.*

The construction of destructor and other furnace arches or crowns by means of blocks of refractory material joggled on the four sides, which are at right angles, or approximately so, to the interior surface of the furnace arch or crown.

21,880 of 1903.—A. TOISOUL, E. A. FRADET, and L. PIEDEFERT (trading as Toisoul, Fradet, and Cie.): *A Crematorium or Crematorium Gas-Furnace, and Method of Working the same.*

The construction of crematoriæ, characterised by the provision in connexion with an incinerating or combustion chamber of a gas fire arrangement, passages for admitting air independently of the firing arrangement, an arrangement for heating the air to be admitted by the waste heat from the products of combustion, and cocks, or valves, and dampers, whereby the admission of gas and air can be regulated independently one of the other.

24,911 of 1903.—H. EARLE (H. Trachsler): *Manufacture of White Cement.*

This invention relates to a process of manufacturing white cement and the production of an article adapted for either indoor or outdoor use. In carrying out the invention, white chalk, kaolin, felspar, or carbonate of sodium, or carbonate of potassium are mixed together in such proportions that the resultant compound shall, when burnt as a cement, give the following composition on analysis—that is to say: silica, from 28 to 30 per cent.; lime, from 61 to 63 per cent.; alumina, from 4 to 6 per cent.; alkalies, from 2 to 3 per cent. All the raw materials specified are freed from iron, and their admixtures may be effected by either the dry or the wet method. After thorough admixture the materials are burnt kilns, or other such like means, as in the process usually employed for the manufacture of Portland cement.

25,360 of 1903.—O. WILHELME: *Street Pavements.*

Production of a pavement, or a pavement foundation from concrete, cement, or other suitable plastic material, by first mounting on the street base cells or frames, composed of strips of tarred cardboard, paper, or other suitable material, filling the cells with the said plastic matter, with or without stamping, and finally rolling or stamping the surface, so as to consolidate the cells without destroying the partitions.

645 of 1904.—BROWN'S FOUNDRY COMPANY, LTD., and J. BROWN: *Fire Grates.*

A domestic fire grate, consisting of bottom capable of sliding in and out at will to adjust the size of the fire, in combination with an adjustable canopy.

3,249 of 1904.—R. M. DAELEN: *Manufacture of Girders, and the like.*

Rolls for producing I-iron girders, and the like, the distinguishing feature being that the first three or five of the groves of the roll are furnished with a curvature in the middle, into which a part of the material forming the blank enters, and is thereupon rolled out, without the exercise of any pressure on the edges of the rolls, so that this pressure is less than with rolls having grooves of the ordinary form.

7,367 of 1904.—R. B. FERGUSON: *A Combined Spirit-level and Angle-gauge.*

The object of this invention is to combine a spirit-level and angle-gauge, for use by carpenters, surveyors, architects, and others, and by the use of which any angle, as well as a horizontal or perpendicular line may be determined. The stock or body of the level, straight-edge, or instrument to which this invention may be applied is formed with a cavity passing transversely through it, and is provided with face plates which slightly overhang the cavity, and a metallic lining which fits the cavity, and is formed with an interiorly-situated spider carrying a hub. On each side of the spider there are sectors having collars which turn freely round screws, working respectively in the end of the hub, and constituting bearings for the sectors. By tightening the screws the sectors may be locked in any desired position, and when the screws are loose, the sectors are free to swing around the screws and the hub. Each sector is formed with an opening extending transversely through it, and bubble glasses are suitably secured in the sector, so as to be visible through these openings. Since the openings extend completely through the sectors, the bubble glasses are visible from each side of the sectors, and owing to the open form of the spiders, the bubble glasses are visible from both sides of the stock. Each sector is provided with an indicator, secured on its outer side, and reading with respect to scales formed on annular dial-plates, secured between the face-plates and the lining, the sectors fitting loosely between the respective dial-plates and the sides of the spider.

7,718 of 1904.—J. P. JORGENSEN: *Moulding Machines for the Manufacture of Bricks, and the like.*

A moulding machine for the manufacture of bricks, and the like, in which the bottom plates are supported by a solid block made in one piece, or divided for the purpose of preventing vibration and loosening of the moulding material during the beating down thereof.

8,050 of 1904.—J. UNDERWOOD and G. E. HACK: *Dividers, Callipers, and the like.*

Dividers, callipers, and the like, consisting in the arrangement of a regulating screw, having right and left hand threads upon it, engaging with pivotally-mounted nuts upon the legs to be adjusted.

8,175 of 1904.—R. E. LEETHAM: *Structures for the Storage and Delivery of Merchandise.*

This consists in the combination with a number of inclined delivery storage compartments, provided with outlets or traps, of a common drop or shoot, by means of which packages delivered from any one of the number of compartments may be led to one point.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

May 16.—By H. M. HEXT (at Chard).

Tatworth, Somerset.—"Chilson Estate," 160 a. 1 r. 4 p., f.	£3,375

May 27.—By BRODIE, TIMBS, & Co. (at Folkestone).

Folkestone, Kent.—113 and 115, Cheriton-rd., u.t. 90½ yrs., g.r. 16*l.*, y.r. 140*l.*	1,460

By COBB'S (at Sittingbourne).

Strood, Kent.—111, Weston-rd., f., q.r. 16*l.*	365
107 and 109, Weston-rd., f., w.r. 40*l.* 6s.	615
Broomhill, freehold building estate, 3 a. 2 r. 15 p.	550

May 28.—By BRUTON, KNOWLES, & Co. (at Gloucester).

Hucclecote, etc., Gloucester.—"The Zoons Farm," 225 a. 3 r. 31 p., f., y.r. 180*l.*	4,275
Twyning, Gloucester.—"Wood End Farm," 130 a. 2 r. 21 p., f., y.r. 300*l.*	5,500
Eldersfield, Worcester.—"Moorend Farm," 88 a. 3 r. 28 p., f., y.r. 80*l.*	1,625

By BRODIE, TIMBS, & Co. (at Canterbury).

Herne Hill, Kent.—"The Dale Farm," 22 a. 2 r. 28 p., f., y.r. 74*l.*	1,570
Canterbury, Kent.—52, St. Dunstan's-st. (offices), f., y.r. 10*l.* 8s.	200

By R. A. & G. THOROWGOOD (at Hertford).

Bennington, Herts.—"Curtain Hill Farm," 33 a. 1 r. 22 p., f., y.r. 34*l.*	750
"High Elm," enclosures, 15 a. 2 r. 38 p., f., y.r. 16*l.*	245

May 30.—By ELLIOTT, SON, & BOYTON.

Regent's Park.—17, Kent-ter., u.t. 22 yrs., g.r. 31*l.* 10s., p.	500

By HERRING, SON, & DAW.

Norwood.—Norbury Hill, "Norbury Hill House" and 5 a. 3 r. 28 p., part f. and part u.t. 2½ yrs., g.r. 30*l.*, p.	5,500

By KEMSLEYS'.

Woodford-Green, Essex.—Salway Hill, "Ivy House," and 6¼ acres, f., p.	4,300
1, Manor Cottages (Golf Club House), f., y.r. 30*l.*	430
2 and 3, Manor Cottages, f., y.r. 46*l.*	650
Sunset-av., a plot of building land, c.	120
Manor-rd., "Manor Cottage," c., y.r. 22*l.*	455
1 to 4, Carlton Cottages, f., y.r. 112*l.*	1,490

By WM. HOUGHTON.

Walthamstow.—Chapel End, "Salisbury Hall Building Estate," 141 a. 0 r. 6 p., f., y.r. 310*l.*	25,000
6, 8, and 10, Albert-rd., f., y.r. 89*l.* 14s.	1,235
High Barnet, Herts.—1, Lorne-villas, f., y.r. 19*l.*	190
New Barnet, Herts.—Victoria-rd., "Brooklea," f., y.r. 26*l.*	360
Potter's Bar, Middlesex.—High-rd., freehold building site, p.	195

By J. H. LYNCH.

St. John's Wood.—16, New-st., u.t. 23½ yrs., g.r. 4*l.*, y.r. 38*l.*	305

By MAY & PHILPOT.

Balham.—7 and 8, Holly-gr., f., w.r. 52*l.*	580

By J. RYMER & Co.

Kingston, Surrey.—Fife-rd., a freehold building site	1,950

By SCOBELL & LAKE.

Crouch End.—26, Park-rd., u.t. 51¼ yrs., g.r. 3*l.* 5s., w.r. 35*l.* 2s.	235
Fulham.—34, Sherbrooke-rd., u.t. 72½ yrs., g.r. 5*l.* 10s., w.r. 36*l.* 8s.	305

By FRED VARLEY & SON.

Kentish Town.—57, Grafton-rd. (s.), f., y.r. 40*l.*	485
Highbury.—205, Blackstock-rd. (s.), u.t. 66 yrs., g.r. 10*l.*, e.r. 50*l.*	400
Stoke Newington.—152, Lordship-rd., u.t. 70 yrs., g.r. 10*l.*, e.r. 65*l.*	550
Wood Green.—11, Mannock-rd., u.t. 96 yrs., g.r. 6*l.*, e.r. 32*l.*	240
Bowes Park.—2, Manor-rd., u.t. 95 yrs., g.r. 7*l.*, e.r. 34*l.*	320

By WILLOUGHBY, SON, & CALLOW.

Norwood.—170, 172, and 174, Norwood-rd. (s.), also stabling, u.t. 41¼ yrs., g.r. 13*l.* 5s., y.r. 194*l.*	£3,000
Norwood-rd., a freehold site, area 3,240 ft., y.r. 20*l.*	400
Dulwich.—Lancaster-rd., f.g. rents 50*l.*, reversion in 75 yrs.	1,363
Norwood.—Court-rd., f.g. rents 14*l.*, reversion in 75 yrs.	371
Chiswick.—13, Ellesmere-rd., u.t. 97 yrs., g.r. 9*l.*, p.	620

By EDWARD WOOD.

Leytonstone.—6 and 8, Wood-st., and plot of land adjoining, f., w.r. 54*l.* 12s.	410
East Ham.—231 and 233, Central Park-rd., u.t. 96 yrs., g.r. 10*l.*, w.r. 72*l.* 16s.	400
Wimbledon.—65 and 67, Haydons-rd. (s.), u.t. 76½ yrs., g.r. 12*l.*, w.r. 74*l.* 2s.	380

By WRIFORD, DIXON, & WINDER.

Bermondsey.—90, Rolls-rd., u.t. 29½ yrs., g.r. 3*l.* 5s., w.r. 33*l.* 16s.	230

By J. H. BETHELL (at East Ham).

Plaistow.—Wigston-rd., fifty-four plots of freehold building land	2,543
Prince Regent's-la., eight plots of freehold building land	481

By ALFRED RICHARDS (at Enfield).

Enfield Highway.—13 to 23 (odd), Oatlands-rd., u.t. 77 yrs., g.r. 18*l.*, w.r. 101*l.* 8s.	395
Waltham Cross, Herts.—Freezywater, "Nursery Cottage" and "Elizabeth Cottage," f., w.r. 41*l.* 12s.	465

May 31.—JOHN BOTT & SONS.

Upton Park.—187 to 195 (odd), Plashet-rd. (s.), u.t. 82 yrs., g.r. 40*l.*, y.r. 196*l.*	1,425

By DEBENHAM, TEWSON, & Co.

Eastcheap.—Botolph-la., St. George's Church site, area 2,890 ft., f., p.	9,000

By DUNCAN & KIMPTON.

Holloway.—172, Tollington-pk. (dining rooms), f., y.r. 60*l.*	1,080
166, 168, and 170, Tollington-pk. (s.), u.t. 43 yrs., g.r. 36*l.*, y.r. 195*l.*	1,910
Herne Hill.—12, Milton-rd., f., y.r. 40*l.*	520
Tooting.—98 and 100, Himley-rd., f., e.r. 65*l.*	620
70, Brightwell-cres., f., w.r. 28*l.* 12s.	360
Dulwich.—Underhill-rd., f.g.r. 7*l.* 10s., reversion in 66 yrs.; also a rental of 8*l.* for 7¼ yrs.	400

By DUNN, SOMAN, & COVERDALE.

Kentish Town.—33, Malden-rd. (s.), u.t. 40½ yrs., g.r. 8*l.*, y.r. 52*l.*	260

By FISHER, STANHOPE, & DRAKE.

Clapton.—2, Chatsworth-rd. (s.), f., y.r. 36*l.*	540
Stoke Newington.—2, Osbaldeston-rd., u.t. 74 yrs., g.r. 9*l.*, e.r. 60*l.*	650

By HARRISONS'.

Woodford.—3, Cleveland-rd., f., e.r. 50*l.*	600

May 31.—By G. HEAD & Co.

Gray's Inn-road and Mecklenburgh-square.—i.g. rents 437*l.* 17s., u.t. 5 yrs., g.r. 178*l.* 10s.	705
Hampstead-road (193 to 209 odd).—i.g. rents 207*l.*, u.t. 4½ yrs., g.r. 63*l.*	440
St. Pancras.—Grafton-pl., i.g. rents 130*l.* 15s., u.t. 3½ yrs., g.r. 50*l.* 10s.	265
Euston-sq., etc., i.g.r. 85*l.*, u.t. 3½ yrs., g.r. 18*l.*	160
Kilburn.—54 and 56, Denmark-rd., u.t. 55½ yrs., g.r. 10*l.*, w.r. 93*l.* 12s.	490
20 and 22, Albert-rd., u.t. 55½ yrs., g.r. 10*l.* 10s., w.r. 85*l.* 16s.	410

By C. SPARROW & SON.

Finchley.—Ballard's-la., "Redbourne Cottage," f., y.r. 65*l.*	1,100
Woodhouse-la., "Heatherley," u.t. 92 yrs., g.r. 5*l.*, p.	635
East Barnet, Herts.—East Barnet-ter., f.g. rents, 42*l.* 6s., reversion in 95 yrs.	895

By FREDK. WARMAN.

Islington.—265, Upper-st. (s.), u.t. 60 yrs., g.r. 30*l.*, y.r. 110*l.*	1,175
Highbury.—18, Framfield-rd., u.t. 90 yrs., g.r. 8*l.*, e.r. 48*l.*	420
Canonbury.—13, Ashby-rd., u.t. 41 yrs., g.r. 10*l.*, e.r. 60*l.*	470
27 and 28, St. Mary's-rd., u.t. 41 yrs., g.r. 4*l.*, y.r. 135*l.*	1,265
Holloway.—39, Tuffnell Park-rd. (with stables), u.t. 45 yrs., g.r. 8*l.*, y.r. 105*l.*	650

By BOYTON, SONS, & BUCKMASTER (at Fulham).

Fulham.—46, Parsons Green-la. (s.), u.t. 76 yrs., g.r. 8*l.*, y.r. 45*l.*	465
63 and 65, Britannia-rd., u.t. 52 yrs., g.r. 9*l.*, e.r. 68*l.*	550

By ALFRED RICHARDS (at Tottenham).

Tottenham.—84 and 86, Church-rd. (s.), u.t. 62 yrs., g.r. 7*l.*, y.r. 60*l.*	710
Brunswick-la., a piece of land, 0 a. 2 r. 16 p., f.	355
5, Princes-st., f., w.r. 18*l.* 4s.	150
Edmonton.—Langhedge-la., "Laburnum Cottage" and plot of land, f., w.r. 18*l.* 4s.	210
25, 27, and 29, Snells-pk., f., w.r. 78*l.*	670

June 1.—By TURNBULL, PARNIE, & Co. (at Glasgow).

Colmonell, Ayrshire.—"The Ballochmorrie Estate," 965 acres	13,520

June 2.—By DEBENHAM, TEWSON, & Co.

Plymouth.—George-st., "The Theatre Royal and Opera House," area 15,500 ft., u.t. 96½ yrs., g.r. 2,000*l.*, including scenery and properties of the "Aladdin" pantomime	10,820
Sydenham.—Miall-rd., f.g. rents 44*l.*, reversion in 75 yrs.	880

By BALCH & BALCH.

Kentish Town.—13, 15, and 17, Prince of Wales-rd. (s.), u.t. 28 yrs., g.r. 5*l.*, y.r. 203*l.*	1,370
Holloway.—36, Bickerton-rd., u.t. 72½ yrs., g.r. 8*l.*, p.	450

By FARRERBROTHER, ELLIS, & Co.
Southwark.—42, Borough High-st. (s.), area 1,400 ft., p. £3,300

By FIELD & SONS.
Holborn.—9 to 15 (odd), Leather-la., 16 and 17, Dorrington-st., 18 and 19, Brookes'-market, 15, 16, and 17, Beauchamp-st. (shops and houses), area 5,115 ft., f., y.r. 416*l.* 6s. 7,100
Bermondsey.—21, 23, and 25, Galley Wall-rd., u.t. 54 yrs., g.r. 6*l.* 6s., w.r. 109*l.* 4s. .. 760

By J. HOOD & SONS.
Forest Gate.—75, Shrewsbury-rd., f., w.r. 44*l.* 4s. 450

By NEWBON, EDWARDS, & SHEPHARD.
Islington.—Liverpool-rd., l.g.r. 22*l.* 10s., reversion in 4½ yrs. 1,700
46, Halliford-st., u.t. 41 yrs., g.r. 6*l.*, y.r. 45*l.* 430
Caledonian-road.—No. 375 (s.), u.t. 38½ yrs., g.r. 8*l.*, y.r. 60*l.* 500
Camden Town.—12, Marquis-rd., u.t. 37½ yrs., g.r. 6*l.*, y.r. 94*l.* 420

By ORGILL, MARKS, & LAWRENCE.
Leamington Spa, Warwick.—The Parade, "The Regent Hotel," area 8,470 yds., f., with goodwill 8,000

By PERKINS & CESAR.
Chelsea.—53, King's-rd. (s.), f., y.r. 110*l.* 2,700

By STIMSON & SON.
Walworth.—60, East-st. (s.), f., y.r. 45*l.* 760
1a, 2a, 3a, 19 to 41, Bronti-pl., area 47,000 ft., y.r. 1,047*l.* 8,100
1 to 18, 6a and 13a, Bronti-pl., area 35,800 ft., y.r. 894*l.* 6,150
18 to 24 (even), Blackwood-st., area 4,270 ft., f., y.r. 137*l.* 16s. 1,220
4 to 16 (even), Blackwood-st. (including the "Richmond Arms" B.-H.), area 7,770 ft., f., y.r. 238*l.* 13s. 8d. 3,100
Camberwell.—22 to 34 (even), 29 to 37 (odd), Dugdale-st.; 108 to 114 (even), Warham-st., f., w.r. 438*l.* 2s. 4,100
Lambeth.—67, 68, and 69, Tower-st.; 17 to 21, Gerridge-st.; 52 to 60 (even), Webber-row, area 6,240 ft., f., w.r. 421*l.* 4s. 2,150
Sunbury, Middlesex.—1, 3, and 4, Parkstone-villas, u.t. 59 yrs., g.r. 15*l.* 15s., e.r. 108*l.* 265

By PERKINS & SONS (at Southampton).
Chilworth, Hants. — "Chilworth-ct." and "Chilworth-gr.," area 5½ acres, f., p. 3,500

June 3.—By B. BAILEY & Co.
Battersea.—233 and 235, Battersea Park-rd. (s.), u.t. 37½ yrs., g.r. 12*l.*, y.r. 110*l.* 1,140
2, Alfred-st., u.t. 37½ yrs., g.r. 4*l.*, y.r. 14*l.* .. 100
Pimlico.—21 to 26, Union-st., u.t. 17 yrs., g.r. 21*l.*, y.r. 146*l.* 770
Manor Park.—17, Albany-rd., and 29, Carlton-rd., u.t. 72 yrs., g.r. 7*l.* 12s., y.r. 44*l.* 400

By KROENIG & Co.
Hendon.—25 to 39 (odd), Ravenstone-rd., f., w.r. 319*l.* 16s. 2,930
Sunny-gdns., "Emile Villa," f., e.r. 45*l.* .. 645
Kentish Town.—14, Oakfield-cres., f., w.r. 46*l.* 16s. 450
East Ham.—50 to 64 (even), 45 to 53 (odd), Champion Cottages, u.t. 81 yrs., g.r. 65*l.*, w.r. 240*l.* 10s. 800
Hendon.—Finchley-la., "Verulam," f., y.r. 35*l.* 460
2, Elm-villas, f., y.r. 30*l.* 405
1 and 2, Florence-st., f., y.r. 52*l.* 441

By WM. HOLLIS.
Hendon.—Garrick-rd., three freehold building plots 265
Finchley.—Squires-la., "Upton Lodge," u.t. 90 yrs., g.r. 9*l.*, e.r. 55*l.* 380

By INMAN & CRIER.
Maida-hill.—23, Lanark-villas, u.t. 46½ yrs., g.r. 5*l.*, y.r. 40*l.* 485
St. John's Wood.—6, Bolton-rd., u.t. 46 yrs., g.r. 10*l.* 10s., w.r. 76*l.* 14s. 350

By MULLETT, BOOKER, & Co.
Hyde Park.—12, Sussex Mews West, u.t. 30½ yrs., g.r. 1*l.*, e.r. 40*l.* 250

By A. R. PEACEY.
Harrow, Middlesex.—1, York-ter., u.t. 96½ yrs., g.r. 6*l.*, e.r. 30*l.* 200

By G. RAMUZ.
Basildon, Essex.—Main-rd., etc., portions of the "Barstable Hall Estate," 29 a. 2 r. 31 p., f. (in lots) 850

By F. J. STAINES.
Bethnal Green.—43 and 45, Mowlem-st., u.t. 18 yrs., g.r. 19*l.*, w.r. 64*l.* 16s. 165
Hackney.—4, Handley-rd., u.t. 35 yrs., g.r. 4*l.* 10s., y.r. 30*l.* 275
Stoke Newington.—1, 3, and 5, Lordship-rd., u.t. 15 yrs., g.r., etc., 4*l.* 17s. 6d., w.r. 70*l.* 4s. 235
Shoreditch.—46 and 48, Weymouth-ter., f., y.r. 72*l.* 990
Haggerston.—1 to 11 (odd), Ilva-pl., f., w.r. 135*l.* 4s. 1,090
Stepney.—James'-pl., l.g.r. 25*l.* 10s., reversion in 34½ yrs. 535

By TYSER, GREENWOOD, & CRIER.
Chiswick.—Riverview-rd., ten freehold building plots 1,200
33, Ellesmere-rd., u.t. 98 yrs., g.r. 10*l.* 10s., e.r. 65*l.* 700
Barnes.—7, Ranelagh-gdns., u.t. 90½ yrs., g.r. 8*l.*, p. 500
31, 41, 47, and 49, Elm Grove-rd., u.t. 90½ yrs., g.r. 28*l.*, y.r. 150*l.* 1,275

Contractions used in these lists.—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; p. for possession; e.r. for estimated rental; w.r. for weekly rental; q.r. for quarterly rental; y.r. for yearly rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; la. for lane; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; av. for avenue; gdns. for gardens; yd. for yard; gr. for grove; b.h. for beer-house; p.h. for public-house; o. for offices; s. for shops; ct. for court.

MEETINGS.

SATURDAY, JUNE 11.

St. Paul's Ecclesiological Society.—Visit to the Church of St. Mary-le-Bow, at 2.30 p.m., and afterwards to St. Mary Aldermary at 3.15, and St. Mildred, Bread-street, at 3.45, under the guidance of Mr. Philip Norman, F.S.A.

Architectural Association.—Second Summer Visit, to Colchester.

Edinburgh Architectural Association.—Visit to Castle Campbell, Dollar.

MONDAY, JUNE 13.

Institute of Sanitary Engineers, Limited.—Organising Committee at 3 o'clock; Examination and Literary Committee at 5 o'clock.

Incorporated British Institute of Certified Carpenters.—Visit to Messrs. Walkers, Parker, & Co.'s Lead Works, Belvedere-road, Lambeth, 6.45 p.m.

WEDNESDAY, JUNE 15.

Institute of Sanitary Engineers, Limited.—Election Committee at 3 o'clock; General Purposes and Finance Committee at 5 o'clock; Half-yearly General Meeting at 7 o'clock.

Builders' Foremen and Clerk of Works' Institution.—Ordinary Meeting of the Members. 8 p.m.

THURSDAY, JUNE 16.

Surveyors' Institution.—Conversazione at the Natural History Museum, South Kensington. 9 to 12 p.m.

SATURDAY, JUNE 18.

Architectural Association.—Visit to Penshurst.

Edinburgh Architectural Association (Associates' Section).—Visit to Donibristle.

TO CORRESPONDENTS.

W. M. (Amounts should have been stated).—J. H. H. (We do not insert lists of tenders unless amounts are stated or the work is carried out at a schedule of prices).—C. O. M.—J. K.—E. T. F. (Below our limit).

NOTE.—The responsibility of signed articles, letters, and papers read at meetings rests, of course, with the authors.

We cannot undertake to return rejected communications; and the Editor cannot be responsible for drawings, manuscripts, or other documents, sent to or left at this office, unless he has specially asked for them.

Letters or communications (beyond mere news items) which have been duplicated for other journals are NOT DESIRED.

All communications must be authenticated by the name and address of the sender, whether for publication or not. No notice can be taken of anonymous communications.

We are compelled to decline pointing out books and giving addresses.

Any commission to a contributor to write an article, or to execute or lend a drawing for publication, is given subject to the approval of the article or drawing, when received, by the Editor, who retains the right to reject it if unsatisfactory. The receipt by the author of a proof of an article in type does not necessarily imply its acceptance.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; those relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

PRICES CURRENT OF MATERIALS.

*** Our aim in this list is to give, as far as possible, the *average* prices of materials, not necessarily the lowest. Quality and Quantity obviously affect prices—a fact which should be remembered by those who make use of this information.

BRICKS, &c.

	£ s. d.	
Hard Stocks.	1 16 0	per 1000 alongside, in river.
Rough Stocks and Grizzles	1 13 0	„ „ „
Facing Stocks ...	2 12 0	„ „ „
Shippers	2 10 0	„ „ „
Flettons	1 10 0	„ at railway depôt.
Red Wire Cuts ...	1 13 0	„ „ „
Best Fareham Red	3 12 0	„ „ „
Best Red Pressed Ruabon Facing	5 0 0	„ „ „
Best Blue Pressed Staffordshire ...	4 4 0	„ „ „
Do. Bullnose	4 10 0	„ „ „
Best Stourbridge Fire Bricks.....	4 8 0	„ „ „
GLAZED BRICKS.		
Best White and Ivory Glazed Stretchers	13 0 0	„ „ „
Headers	12 0 0	„ „ „
Quoins, Bullnose, and Flats.....	17 0 0	„ „ „
Double Stretchers	19 0 0	„ „ „
Double Headers...	16 0 0	„ „ „
One Side and two Ends	19 0 0	„ „ „
Two Sides and one End	20 0 0	„ „ „
Splays, Chamferred, Squints.	20 0 0	„ „ „
Best Dipped Salt Glazed Stretchers, and Header	12 0 0	„ „ „
Quoins, Bullnose, and Flats.....	14 0 0	„ „ „
Double Stretchers	15 0 0	„ „ „
Double Headers...	14 0 0	„ „ „
One Side and two Ends	15 0 0	„ „ „
Two Sides and one End	15 0 0	„ „ „

BRICKS, &c.—(*Continued*).

Splays, Chamferred, Squints,	£ 14 0 0	s. d. per 1000 at railway depôt.
Second Quality White and Dipped Salt Glazed	2 0 0	„ less than best.
	s. d.	
Thames and Pit Sand.....	7 3	per yard, delivered.
Thames Ballast.....	6 0	„ „
Best Portland Cement	30 0	per ton, „
Best Ground Blue Lias Lime	21 0	„ „

NOTE.—The cement or lime is exclusive of the ordinary charge for sacks.

Grey Stone Lime.....12s. 0d. per yard, delivered.
Stourbridge Fireclay in sacks 27s. 6d. per ton at rly. dpt.

STONE.

	s. d.	
BATH STONE—delivered on road waggons, Paddington Depôt	1 6½	per ft. cube.
Do. do. delivered on road waggons, Nine Elms Depôt	1 8½	„ „
PORTLAND STONE (20 ft. average)—		
Brown Whitbed, delivered on road waggons, Paddington depôt, Nine Elms depôt, or Pimlico Wharf...	1	„ „
White Basebed, delivered on road waggons, Paddington depôt, Nine Elms depôt, or Pimlico Wharf...	2	„
	s. d.	
Ancaster in blocks	1 11	per ft. cube, deld. rly. depôt.
Beer „	1 6	„ „
Greenshill „	1 10	„ „
Darley Dale in blocks...	2 4	„ „
Red Corsehill „	2 5	„ „
Closeburn Red Freestone	2 0	„ „
Red Mansfield „	2 4	„ „
YORK STONE—*Robin Hood Quality*	s. d.	
Scappled random blocks	2 10	per ft. cube, „
6 in. sawn two sides landings to sizes (under 40 ft. super.)	2 3	per foot super. „
6 in. rubbed two sides ditto, ditto	2 6	„ „
3 in. sawn two sides slabs (random sizes)	0 11½	„ „
2 in. to 2½ in. sawn one side slabs (random sizes)	0 7½	„ „
1½ in. to 2 in. ditto, ditto	0 6	„ „
HARD YORK—		
Scappled random blocks	3 0	per ft. cube, „
6 in. sawn two sides, landings to sizes (under 40 ft. super.)	2 8	per ft. super. „
6 in. rubbed two sides Ditto	3 0	„ „
3 in. sawn two sides (slabs random sizes)	1 2	„ „
2 in. self-faced random flags	0 5	„ „
Hopton Wood (Hard Bed) in blocks	2 3	per ft. cube.
„ „ „ 6 in. sawn both sides landings	2 7	deld. rly. depôt per ft. super. deld. rly. depôt
„ „ „ 3 in. do.	1 2½	„ „

SLATES.

in. in.	£ s. d.	
20 × 10 best blue Bangor	13 2 6	per 1000 of 1200 at r. d.
20 × 12 „ „	13 17 6	„ „
20 × 10 first quality „	13 0 0	„ „
20 × 12 „ „ „	13 15 0	„ „
16 × 8 „ „ „	7 5 0	„ „
20 × 10 best blue Portmadoc	12 12 6	„ „
16 × 8 „ „	6 12 6	„ „
20 × 10 best Eureka unfading green .	15 17 6	„ „
20 × 12 „ „	18 7 6	„ „
18 × 10 „ „	13 5 0	„ „
16 × 8 „ „	10 5 0	„ „
20 × 10 permanent green	11 12 6	„ „
18 × 10 „ „	9 12 6	„ „
16 × 8 „ „	6 12 6	„ „

TILES.

	s. d.	
Best plain red roofing tiles .	42 0	per 1000 at rly. depôt.
Hip and Valley tiles ...	3 7	per doz. „ „
Best Brosely tiles.....	50 0	per 1000 „ „
Do. Ornamental tiles	52 6	„ „ „
Hip and Valley tiles ...	4 0	per doz. „ „
Best Ruabon red, brown, or brindled do. (Edwards)	57 6	per 1000 „ „
Do. Ornamental do	60 0	„ „ „
Hip tiles	4 0	per doz. „ „
Valley tiles	3 0	„ „ „
Best Red or Mottled Staffordshire do. (Peakes).....	51 9	per 1000 „ „
Do. Ornamental do.....	54 6	„ „ „
Hip tiles	4 1	per doz. „ „
Valley tiles	3 8	„ „ „
Best "Rosemary" brand plain tiles.....	48 0	per 1000 „ „
Best Ornamental tiles	50 0	„ „ „
Hip tiles	4 0	per doz. „ „
Valley tiles	3 8	„ „ „
Best "Hartshill" brand plain tiles, sand faced.	50 0	per 1000 „ „
Do. pressed.....	47 6	„ „ „
Do. Ornamental do	50 0	„ „ „
Hip tiles	4 0	per doz. „ „
Valley tiles	3 6	„ „ „

WOOD.

	At per standard. £ s. d.	£ s. d.
Deals: best 3 in. by 11 in. and 4 in. by 9 in. and 11 in	15 10 0	16 10 0
Deals: best 3 by 4.....	14 10 0	15 10 0
Battens: best 2½ in. by 7 in. and 8 in., and 3 in. by 7 in. and 8 in.	11 10 0	12 10 0
Battens: best 2½ by 6 and 3 by 6 ..	0 10 0	less than 7 in. and 8 in.
Deals: seconds	1 0 0	less than best
Battens: seconds	0 10 0	„ „ „
2 in. by 4 in. and 2 in. by 6 in....	9 0 0	9 10 0
2 in. by 4½ in. and 2 in. by 5 in....	8 10 0	9 10 0

WOOD.—(*continued*).

	At per standard. £ s. d.	£ s. d.
Foreign Sawn Boards—		
1 in. and 1¼ in. by 7 in.	0 10 0	more than battens.
¾ in.	1 0 0	,,
	At per load of 50 ft.	
Fir timber: best middling Danzig or Memel (average specification)	4 10 0	5 0 0
Seconds	4 5 0	4 10 0
Small timber (8 in. to 10 in.)	3 12 6	3 15 0
Small timber (6 in. to 8 in.)	3 0 0	3 10 0
Swedish balks	2 15 0	3 0 0
Pitch-pine timber (30 ft. average)	3 5 0	3 15 0
JOINERS' WOOD.		
White Sea: first yellow deals,	At per standard.	
3 in. by 11 in	23 0 0	24 0 0
3 in. by 9 in.	21 0 0	22 10 0
Battens, 2½ in. and 3 in. by 7 in.	17 0 0	18 10 0
Second yellow deals, 3 in. by 11 in.	18 10 0	20 0 0
,, ,, 3 in. by 9 in.	17 10 0	19 0 0
Battens, 2½ in. and 3 in. by 7 in.	13 10 0	14 10 0
Third yellow deals, 3 in. by 11 in. and 9 in.	15 10 0	16 10 0
Battens, 2½ in. and 3 in. by 7 in.	11 10 0	12 10 0
Petersburg: first yellow deals, 3 in. by 11 in.	21 0 0	22 10 0
Do. 3 in. by 9 in.	18 0 0	19 10 0
Battens	13 10 0	15 0 0
Second yellow deals, 3 in. by 11 in.	16 0 0	17 0 0
Do. 3 in. by 9 in.	14 10 0	16 0 0
Battens	11 0 0	12 10 0
Third yellow deals, 3 in. by 11 in.	13 10 0	14 0 0
Do. 3 in. by 9 in.	13 0 0	14 0 0
Battens	10 0 0	11 0 0
White Sea and Petersburg:—		
First white deals, 3 in. by 11 in.	14 10 0	15 10 0
,, ,, 3 in. by 9 in.	13 10 0	14 10 0
Battens	11 0 0	12 0 0
Second white deals, 3 in. by 11 in.	13 10 0	14 10 0
,, ,, 3 in. by 9 in.	12 10 0	13 10 0
,, ,, battens	9 10 0	10 10 0
Pitch-pine: deals	16 10 0	20 0 0
Under 2 in. thick extra	0 10 0	1 0 0
Yellow Pine—First, regular sizes	35 0 0	upwards.
Oddments	24 0 0	26 0 0
Seconds, regular sizes	26 10 0	28 10 0
Yellow Pine oddments	22 0 0	24 0 0
Kauri Pine—Planks, per ft. cube	0 3 6	0 5 0
Danzig and Stettin Oak Logs—		
Large, per ft. cube	0 2 6	0 3 6
Small ,, ,,	0 2 3	0 2 6
Wainscot Oak Logs, per ft. cube.	0 5 0	0 5 6
Dry Wainscot Oak, per ft. sup. as inch	0 0 7	0 0 8
¼ in. do. do.	0 0 6½	—
Dry Mahogany—Honduras, Tabasco, per ft. super. as inch	0 0 9	0 0 11
Selected, Figury, per ft. sup. as inch	0 1 6	0 2 0
Dry Walnut, American, per ft. sup. as inch	0 0 10	0 1 0
Teak, per load	17 0 0	21 0 0
American Whitewood Planks—per ft. cube	0 4 0	—
Prepared Flooring—	Per square.	
1 in. by 7 in. yellow, planed and shot	0 13 6	0 17 6
1 in. by 7 in. yellow, planed and matched	0 14 0	0 18 0
1¼ in. by 7 in. yellow, planed and matched	0 16 0	1 0 0
1 in. by 7 in. white, planed and shot	0 12 0	0 14 6
1 in. by 7 in. white, planed and matched	0 12 6	0 15 0
1¼ in. by 7 in. white, planed and matched	0 15 0	0 16 6
¾ in. by 7 in. yellow, matched and beaded or V-jointed brds.	0 11 0	0 13 6
¾ in. by 7 in. do. do. do.	0 14 0	0 18 0
1 in. by 7 in. white do. do.	0 10 0	0 11 6
1 in. by 7 in. do. do. do.	0 11 6	0 13 6

6 in. at 6d. to 9d. per square less than 7 in.

JOISTS, GIRDERS, &c.

	In London, or delivered Railway Vans, per ton. £ s. d.	£ s. d.
Rolled Steel Joists, ordinary sections	6 5 0 ...	7 5 0
Compound Girders, ordinary sections	8 2 6 ...	9 5 0
Angles, Tees and Channels, ordinary sections	7 17 6 ...	8 17 6
Flitch Plates	8 5 0 ...	8 15 0
Cast Iron Columns and Stanchions including ordinary patterns...	7 2 6 ...	8 5 6

METALS.

	Per ton, in London. £ s. d.	£ s. d.
IRON—		
Common Bars	7 5 0 ...	7 15 0
Staffordshire Crown Bars, good merchant quality	7 15 0 ...	8 5 0
Staffordshire "Marked Bars"	10 0 0 ...	—
Mild Steel Bars	8 15 0 ...	9 5 0
Hoop Iron, basis price	9 5 0 ...	9 10 0
,, ,, Galvanized	17 10 0 ...	—
('And upwards, according to size and gauge.)		
Sheet Iron (Black)—		
Ordinary sizes to 20 g.	9 15 0 ...	—
,, ,, 24 g.	10 15 0 ...	—
,, ,, 26 g.	12 5 0 ...	—
Sheet Iron, Galvanised, flat, ordinary quality—		
Ordinary sizes—6 ft. by 2 ft. to 3 ft. to 20 g.	12 15 0 ...	—
Ordinary sizes to 22 g. and 24 g.	13 5 0 ...	—
,, ,, 26 g.	14 5 0 ...	—
Sheet Iron, Galvanised, flat, best quality—		
Ordinary sizes to 20 g.	16 0 0 ...	—
,, ,, 22 g. and 24 g.	16 10 0 ...	—
,, ,, 26 g.	18 0 0 ...	—
Galvanised Corrugated Sheets—		
Ordinary sizes 6 ft. to 8 ft. 20 g.	12 10 0 ...	—
,, ,, 22 g. and 24 g.	13 0 0 ...	—
,, ,, 26 g.	13 15 0 ...	—

METALS—*Continued.*

	Per ton, in London. £ s. d.	£ s. d.
Best Soft Steel Sheets, 6 ft. by 2 ft.	£ 11 15 0 ...	—
to 3 ft. by 20 g. and thicker		
Best Soft Steel Sheets, 22 g. & 24 g.	12 15 0 ...	—
,, ,, ,, 26 g.	14 0 0 ...	—
Cut nails, 3 in. to 6 in.	9 0 0 ...	9 10 0
(Under 3 in., usual trade extras.)		

LEAD, &c.

	Per ton, in London. £ s. d.	£ s. d.
LEAD—Sheet, English, 3lb. and up	14 10 0 ...	—
Pipe in coils	15 0 0 ...	—
Soil pipe	17 10 0 ...	—
Compo pipe	17 10 0 ...	—
ZINC—Sheet—		
Vieille Montagne ...ton	27 5 0 ...	—
Silesian	27 0 0 ...	—
COPPER—		
Strong Sheet...per lb.	0 0 10½ ...	—
Thin ,, ... ,,	0 0 11½ ...	—
Copper nails ... ,,	0 0 11 ...	—
BRASS—		
Strong Sheet... ,,	0 0 10 ...	—
Thin ,, ... ,,	0 0 11 ...	—
TIN—English Ingots ... ,,	0 1 4 ...	—
SOLDER—Plumbers' ... ,,	0 0 6½ ...	—
Tinmen's... ,,	0 0 8 ...	—
Blowpipe... ,,	0 0 9 ...	—

ENGLISH SHEET GLASS IN CRATES.

15 oz. thirds	2¼d. per ft. delivered.
,, fourths	1¾d. ,, ,,
21 oz. thirds	3¼d. ,, ,,
,, fourths	2¾d. ,, ,,
26 oz. thirds	4d. ,, ,,
,, fourths	3¼d. ,, ,,
32 oz. thirds	5d. ,, ,,
,, fourths	4¼d. ,, ,,
Fluted Sheet, 15 oz.	3d. ,, ,,
,, 21 oz.	4d. ,, ,,
½ Hartley's Rolled Plate	1¾d. ,, ,,
⅓ ,, ,, ,,	1¾d. ,, ,,
,, ,, ,,	2¾d. ,, ,,

OILS, &c.

		£ s. d.
Raw Linseed Oil in pipes or barrels	per gallon	0 1 5
,, ,, in drums	,,	0 1 8
Boiled ,, ,, in pipes or barrels	,,	0 1 8
,, ,, in drums	,,	0 1 11
Turpentine, in barrels	,,	0 3 7
,, in drums	,,	0 3 9
Genuine Ground English White Lead	per ton	19 0 0
Red Lead, Dry	,,	19 0 0
Best Linseed Oil Putty	per cwt.	0 6 6
Stockholm Tar	per barrel	1 12 0

VARNISHES, &c.

	Per gallon. £ s. d.
Fine Pale Oak Varnish	0 8 0
Pale Copal Oak	0 10 6
Superfine Pale Elastic Oak	0 12 6
Fine Extra Hard Church Oak	0 10 0
Superfine Hard-drying Oak, for seats of Churches	0 14 0
Fine Elastic Carriage	0 12 6
Superfine Pale Elastic Carriage	0 16 0
Fine Pale Maple	0 16 0
Finest Pale Durable Copal	0 18 0
Extra Pale French Oil	1 1 0
Eggshell Flatting Varnish	0 18 0
White Copal Enamel	1 4 0
Extra Pale Paper	0 12 0
Best Japan Gold Size	0 10 6
Best Black Japan	0 16 0
Oak and Mahogany Stain	0 9 0
Brunswick Black	0 8 6
Berlin Black	0 16 0
Knotting	0 10 0
French and Brush Polish	0 10 0

TERMS OF SUBSCRIPTION.

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TENDERS.

Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than* 10 *a.m. on Thursdays.* [N.B.—We cannot publish Tenders unless authenticated either by the architect or the building-owner; and we cannot publish announcements of Tenders accepted unless the amount of the Tender is given, nor any list in which the lowest Tender is under 100*l.*, unless in some exceptional cases and for special reasons.]

* Denotes *accepted.* † Denotes *provisionally accepted.*

BALLYCLOUGH (Ireland).—For erecting a dispensary residence at Ballyclough, Mallow, for the Guardians. Mr. E. Hayes, architect, Spa-walk, Mallow:—

C. Kelleter	£1,148 0	P. Murphy, 24, John-st., Cork*	£1,090 0
P. Kuffer	1,119 10		

BATHGATE.—For erecting a new church at Bathgate, for St. David's Congregation. Mr. J. Graham Fairley, architect, India-buildings, Edinburgh. Quantitities by Mr. Fairley, Ordained Surveyor, India-buildings, Edinburgh:—

Builders: W. Roberts & Sons, Bathgate	£2,898 4 2
Joiners: J. Spiers & Sons, Bathgate	1,319 10 5½
Slaters: J. Easton & Sons, Bathgate	164 8 0
Plasterers: J. Easton & Sons, Bathgate	30 19 0
Plumbers: R. Robertson & Sons, Bathgate	199 10 0
Painter: W. Heugh, Bathgate	59 18 0
Glaziers: Dickson & Walker, Edinburgh	67 12 6
Heating Engineers: D. Lowe & Sons, Edinburgh	173 10 7

[Total, £4,913 12s. 8½d.]

BELFAST.—For building new kitchen at main building of workhouse, for the Guardians. Messrs. Young & Mackenzie, civil engineers:—

Lowry & Percy	£2,095 0 0	McRoberts & Armstrong	£1,825 0 0
McCammond & Son	1,625 0 0	McIntyre Bros.	1,918 11 0
J. A. Gordon	1,675 0 0	W. Dowling, Belfast*	1,450 0 0
J. Kidd	1,682 10 0		

BRADFORD. — Accepted for rebuilding photographer's premises, Barkerend-road, for the Coe Collotype Co., Ltd. Mr. T. Leadley, architect, 3, Coleridge-place, Bradford. Quantities by architect:—

Mason, etc.: G. Hullah, North Wing, Bradford	£683
Joiner, etc.: J. Fortune, Adolphus-street Bradford	
Plumbers, etc.: W. Bollans & Son, Churchbank, Bradford	
Plasterer: W. Hargreaves, Peckover-street, Bradford	
Slaters: Hill & Nelson, Edmund-street, Bradford	
Ironfounder: F. Roberts, Victoria Foundry, Bramley, near Leeds	

BRANDON.—For outfall sewer and sewage disposal works for Brandon Colliery and Littleburn, near Durham; for the Urban District Council. Mr. J. E. Parker, C.E., Post Office-chambers, Newcastle-on-Tyne:—

G. T. Manners, Gilesgate, Durham* £1,230

BRIGHTON.—For the supply of 5,000 ft. run, 12 in. by 6 in., granite flat kerb, and 5,000 ft. run, 12 in. by 6 in., granite flat channel, for the Town Council. Mr. F. J. C. May, Borough Engineer and Surveyor, Town Hall, Brighton:—

—	—	Flat Kerb 12 in. by 6 in. at per foot Run.	Flat Channe 11in. by 6 in. at per foot Run.
		s. d.	s. d.
Blichfeldt & Co.	Norway	1 1¼	1 0¾
E. J. Praagh & Co., Ltd., London*	Norway	1 1¾	1 0¾
W. Griffith & Co., Ltd.	Norway	1 1½	1 1
A. & F. Manuelle	Norway	1 1¾	1 1½
Brookes, Ltd.	Norway	1 2½	1 2
J. Brunton	Norway	1 5	1 4½

CLAYTON-LE-MOORS (Lancs.).—For paving, etc., Chequers-road, etc., for the Urban District Council. Mr. A. Dodgeon, Surveyor to Council. Quantities by Surveyor:—

J. C. Hindle, Blackburn* (schedule of prices).

CLAYTON-LE-MOORS.—For concreting sewer near Albion Mill, for the Urban District Council. Mr. A. Dodgeon, Surveyor to the Council. Quantities by Surveyor:—

J. Sharples, Accrington* (schedule of prices).

CLAYTON-LE-MOORS.—For constructing a brick culvert at Super Clough Tip, for the Urban District Council. Mr. A. Dodgeon, Surveyor to the Council. Quantities by Surveyor:—

J. Sharples, Accrington* (schedule of prices).

CLAYTON-LE-MOOR. — For paving portion of Whinney Hill-road, for the Urban District Council. Mr. A. Dodgeon, Surveyor to Council. Quantities by Surveyor:—

J. C. Hindle, Blackburn* (schedule of prices).

HALE.—For making-up Harrop-road, for the Urban District Council. Mr. T. Blagburn, Surveyor:—

M. Naylor & Sons	£1,779 7 0	J. Mitchell & Son	£1,125 10 0
Ex., T. Barber	1,409 0 0	G. Bozson	1,090 7 0
W. Woodfine	1,331 19 1	Bethell & Sons	1,082 13 9
Garner & Owen	1,275 14 0	S. Hutton, Stamford-rd., Bowdon*	1,048 1 6
J. Hamilton & Son	1,171 0 0		

HURSTBOURNE TARRANT (Hants.).—For additions to school at Hurstbourne Tarrant. Messrs. W. & G. A. Bell, architects, Andover:—

E. Godwin, Hurstbourne Tarrant* £460

IPSWICH.—For additions and alterations to the Laundry, St. John's Home, Freehold-road, for the Guardians. Mr. H. J. Wright, architect, 4, Museum-street, Ipswich:—

G. Grimwood & Sons, Princes-street, Ipswich* £997

LEIGH (Lancs.).—For the laying of about 2,750 yds. of cast-iron water-pipes, for the Gas and Water Committee. Mr. J. Gibson, gas and water engineer, Leigh, Lancashire:—

P. O'Malia	£1,685 0 0	Bennie & Thompson	£874 2 6
T. Turner	1,052 13 4	J. Downham	813 17 4
J. Farrel	1,015 0 0	P. & S. Kearsley, 198, Twist-lane, Leigh*	762 1 8
F. E. Applegate	1,004 12 6		
W. Jowett	989 8 4		
T. Rowland	926 4 2		
Holme & King	878 0 0		

LINGWOOD (Norfolk).—For erecting a villa residence. Mr. Arthur J. Chambers, architect and surveyor, Norwich:—

J. Gedge	£978 0 0	W. G. Plumb	£776 10 0
R. Bayes	976 0 0	R. W. Riches, Postwick*	751 0 0
J. J. Howes	850 0 0		
J. J. Ainslie	841 0 0		

[Architect's estimate, £830.]

LLANELLY.—For sewering of the Forge district and Pembrey-road, for the Urban District Council. Mr. G. Watkeys, C.E., Town Hall, Llanelly:—

T. P. Jones	£3,200 0	G. Mercer	£2,985 17
F. J. Vivian	3,072 13		

[The Council decided to carry out the work themselves.]

TENDERS—*Continued on page* 649.

CONTRACTS AND PUBLIC APPOINTMENTS.

(For some Contracts, &c., still open, but not included in this List, see previous issues.)

CONTRACTS.

Nature of Work or Materials.	By whom Advertised.	Forms of Tender, etc., supplied by	Tenders to be delivered
Townshend-avenue Works (Section 2)	Devonport Borough Council	J. F. Burns, Boro' Surv., Municipal Offices, 29, Ker-st., Devonport	June 11
Lane between Barton & Townshend-av. (Street Works)	do.	do.	do.
Road Works, Barton-avenue (Section 3)	do.	do.	do.
Rebuilding Part of Retort House, Droylsden	Manchester Gas Committee	C. Nickson, Gas Department, Town Hall, Manchester	do.
Police Station, Drighlington, near Bradford	West Riding County Council	J. Vickers Edwards, County Architect, Wakefield	June 13
Electric Light Installation at Car Depot	Colchester Corporation	A. R. Sillar, Boro' Electrical Engineer, 36, Stanwell-st., Colchester	do.
500 tons of Nowegian Granite Setts	Cleckheaton U.D.C.	J. Armitage, Clerk, Town Hall, Cleckheaton	do.
Cleansing of Ashpits	Whickham U.D.C.	J. B. Renton, Surveyor, Council Offices, Whickham	do.
Stores for Workhouse, etc.	Leicester Guardians	Poor Law Offices, Pocklington's-walk, Leicester	do.
Infants' School, Thornton-lane	Bradford Education Committee	Architect's Department, Education Office, Manor-row, Bradford	do.
Thirty-three Houses, etc., Tynewydd Estate, Porth	Mr. W. T. Davies	Lewis & Morgan, Architects, Market-square, Pontypridd	do.
C.I. Pipes (Collingham Water Supply)	Newark R.D.C.	H. Walker & Son, Engineers, Albion-ch'mb's, King-st., Nottingham	do.
Pair of Semi-detached Villas, Moy-road, Aberfan		W. Dowdeswell, Architect, Treharris	do.
Rebuilding the Queen's Theatre, Gateshead-on-Tyne	Messrs. Bolam & Bacon	J. W. Frazer & Corking, Architects, 49, Grey-street, Newcastle	June 14
Painting Public Lamps	Hertford Corporation	Borough Surveyor's Office, Hertford	do.
Workshop at Workhouse	Cannock Guardians	A. Veall, Architect, 84, Darlington-street, Wolverhampton	do.
Reinstating Floors at Isolation Block	do.	do.	do.
Painting, etc., at Five Elementary Schools	Carlisle Education Committee	H. C. Marks, Surveyor, 36, Fisher-street, Carlisle	do.
Four Villas at Aberbargoed	The Powell Duffryn Steam Coal Co.	G. Kenshole, Architect, Station-road, Bargoed	do.
Rebuilding the Quarry Arms, Aberbargoed	Mr. D. F. Pritchard	do.	do.
Twenty Dwelling-houses, Plas Farm, Pengam	Pengam No. 3 Building Club	do.	do.
Ambulance Shed, etc., Warwick-road Hospital	Banbury Town Council	N. H. Dawson, Borough Surveyor, Town Hall, Banbury	do.
Iron Fence, Warwick-road Hospital	do.	do.	do.
Hauling and Horse Hire	Kingswood U.D.C.	H. D. Strange, Surveyor, Council Offices, Kingswood, Bristol	do.
External Painting of Cork District Lunatic Asylum		W. H. Hill & Son, Architects, 28, South-Mall, Cork	do.
Six Cottages, Mayfield-road, Bridlington	Mr. S. Dyer	S. Dyer, Architect, 29, Quay-road, Bridlington	do.
Two Houses, Derby-street, Barnsley	Mr. M. Fowler	A. Whitaker, Architect, Worsborough Bridge, Barnsley	do.
Alterations, Holy Trinity Girls' School, Barnstaple		J. C. Southcombe, Architect and Surveyor, Barnstaple	do.
Twenty-five Double-hung Windows, Infirmary Wkhse	Ardee Guardians	The Architect, Laurence-street, Drogheda	do.
*Works of Street Improvement	Bromley Borough Council	Borough Engineer, Municipal Offices, Bromley, Kent	do.
Police Station Buildings, Oldbury	Standing Joint Committee, Worc.	H. Rowe, County Surveyor, Worcester	June 15
Roofs, Seats, etc., in Sebergham Church, Cumberland		J. H. Martindale, Architect, Viaduct-chambers, Carlisle	do.
Painting, etc., at Infirmary, Farnham	Guardians	Friend & Lloyd, Architects, Aldershot	do.
Wrought Iron Roundbars, etc.	East Indian Railway Co.	C. W. Young, Secretary, Nicholas-lane, London, E.C.	do.
Caretaker's Cottage, etc., Bluebell Graveyard	South Dublin R.D.C.	T. J. Byrne, Surveyor, 1, James-street, Dublin	do.
Cloak Rooms at Buddle Schools, Wallsend	Wallsend Corporation	G. Hollings, Borough Surveyor's Office, High-street, Wallsend	do.
Drainage Works, Headington and Cowley,	Headington R.D.C.	H. H. Humphreys, Engineer, 28, Victoria-street, Westminster	do.
Stores	Metropolitan Asylums Board	T. Duncombe Mann, Office of the Board, Victoria Embankm't, E.C.	do.
Twelve Dwelling Houses, Doncaster-road, Thurnscoe	Mr. W. Morton	J. R. Dodds, Engineer, 22, St. Mary's-road, Wheatley, Doncaster	do.
Stables, etc., Hart-street	Brentwood U.D.C.	J. E. Fothergill, Town Hall, Brentwood	do.
Two Cottages, Southwell		W. Vickers, Southwell	do.
Granite	Northfleet U.D.C.	Office of the Surveyor, The Hill, Northfleet	do.
Stores and Materials	Heywood & Middleton Water Board	J. Diggle, Water Engineer, Water Board Offices, Heywood	June 16
Cast Iron Pipes	Rhondda U.D.C.	O. Thomas, Gas and Water Offices, Pentre, Glam.	do.
Rebuilding Small Bridges	Inverness-shire County Council	A. Mackenzie, C.E., Surveyor, County Buildings, Kingussie	do.
Additions to Freston School		Bisshopp & Cautley, Architects, 32, Museum-street, Ipswich	do.
Kentish Ragstone	Newhaven R.D.C.	W. Gates, Clerk, 86, High-street, Lewes	do.
C.I. Water Mains	Rugby U.D.C.	D. G. Macdonald, Surveyor, Rugby	do.
Additions, Nurses' Home, Woodland-rd., Barry Dock		W. E. Knapman, Architect, Pembroke-chambers, Barry Dock	do.
Billiard Room, etc., at South Moor, Durham	Mr. M. Martin	G. T. Wilson, Architect, 21, Durham-road, Blackhill, co. Durham	do.
Foundations, etc., Isolation Block, Small Pox Hospital	Scarborough Town Council	H. W. Smith, Boro' Engineer and Surv., Town Hall, Scarborough	do.
Wesleyan Chapel, Horninglow		Rowland & Sons, 32, Union-street, Burton-on-Trent	do.
Repairing, Paint., etc., Siloam Chapel, Pentre-Estyll		At the Chapel House	do.
Two Dwelling-houses, North-road, Wingate	Durham Miners' Association	F. Grant, Secretary, North-road, Wingate	June 17
Athletic Ground Work, Jordan Hill	Glasgow Academical Club	Kyle & Frew, C.E., 216, West George-street, Glasgow	do.
Manhole and Culverting	Church Stretton U.D.C.	S. Gingell Jones, Surveyor, 26, Castle-street, Shrewsbury	do.
Sawn Pitch-Pine Logs, Caversham Lock, Reading	Thames Conservancy	Conservators' Offices, Victoria Embankment, E.C.	do.
*New Coastguard Detachment, Speeton, Yorkshire	Admiralty	Director of Works Department, 21, Northumberland-avenue, W.C.	do.
*New Coastguard Buildings, Prawle Point, S. Devon	do.	do.	do.
*Supply Steam Piping to Laundry, etc., at Workhouse	St. George in the East Guardians	Clerk's Office, Raine-street, Old Gravel-lane, E.	do.
Byre, Cumberland, etc., Lunatic Asylum	Asylum Committee	G. D. Oliver, County Architect, Carlisle	June 18
Telephone & Fire Alarm Install., Asylums, Bridgend	Glamorgan County Asylum Com.	W. E. R. Allen, Clerk to Com. of Visitors, Glam. C.C. Offices, Cardiff	do.
Cottage, Coventry-road, Lutterworth	Coventry General Charities Trustees	H. Chattaway, Architect, Trinity Churchyard, Coventry	do.
Public Convenience	Edinburgh City Council	Burgh Engineer, City-chambers, Edinburgh	do.
Reconstruction of Market Buildings, Bridgend	Rt. Hon. Earl of Dunraven	H. Martin & Son, Architects, 26, Paradise-street, Birmingham	do.
Six Shops	do.	do.	do.
Constructional Ironwork at Market, Bridgend	do.	do.	do.
Stores	Manchester Electricity Committee	F. E. Hughes, Sec., Elec. Department, Town Hall, Manchester	do.
Extension of Water Mains, Cheslyn Hay	Cannock R.D.C.	H. M. Whitehead, Engineer to Council, Penkridge, Stafford	do.
Carlesmoor Tunnel Bricks, Masham Scheme	Harrogate Corporation	E. W. Dixon, Engineer, 14, Albert-street, Harrogate	do.
12-ton Road Roller and Scarifier	Guildford R.D.C.	J. Anstee, C.E., Council's Offices, Commercial-road, Guildford	do.
Car Wheels and Axles	Manchester Tramways Committee	J. M. M'Elroy, Tramways Department, 55, Piccadilly, Manchester	do.
Repairs to Cemetery Wall, Chapel Hill	Basingstoke Burial Board	F. R. Phillips, Surveyor to the Board, Basingstoke	do.
Making-up of Streets	Stretford U.D.C.	E. Worrall, Surveyor, Council Offices, Old Trafford	June 20
Vicarage and Stable, Kimbolton		Nicholson & Hartree, Architects, Hereford	do.
Stores	Leeds Gas Committee	R. H. Townsley, Gas Offices, Leeds	do.
Pumping Plant	Huddersfield Corporation	J. W. Schofield, Waterworks Manager, Town Hall, Huddersfield	do.
Pitch Pine Partition Screen	Darlington Education Committee	A. C. Coffin, Secretary, Education Office, Darlington	do.
Painting, etc., Elementary Schools & Technical Coll.	do.	do.	do.
Lancashire Boiler (27 ft. by 7 ft.)	Blackpool Sanitary Committee	J. S. Brodie, Borough Engineer, Town Hall, Blackpool	do.
Disinfector	do.	do.	do.
Laundry Machinery and Fittings	do.	do.	do.
Play-shed, Portland-road School, Halifax	Education Committee	J. Lord, C.E., Town Hall, Halifax	do.
Stores	G.W.Ry. Co.	G. K. Mills, Secretary, Paddington Station, London	do.
Private Street Works	Pontypridd U.D.C.	P. R. A. Willoughby, A.M.Inst.C.E., District C'l Offices, Pontypridd	do.
Pumping Station, Cranham-lane, Upminster	Romford R.D.C.	J. Simmons, M.Inst.C.E., Bank-chambers, Doncaster	do.
Granite	Ely U.D.C.	W. McKelvie, City Surveyor's Office, Ely	do.
Stone and Concrete Bridge at Wainsford	Lymington R.D.C.	J. D. Rawlins, Clerk, 38, High-street, Lymington	do.
School, Park-road, Abertillery		W. Beddoe Rees, A.R.I.B.A., 37, St. Mary-street, Cardiff	do.
C.I. Pipes, etc.	Keighley Gas Committee	J. Laycock, Gas Engineer, Gas Offices, Cook-lane, Keighley	do.
Alterations, etc., to Council School, Gilberdike	East Riding Education Committee	Clerk of Works, County Hall, Beverley	do.
Sewering Alma and Lawn Mills, Kimberley	Basford R.D.C.	S. Maylan, Engineer, Public Offices, Basford	do.
Church at Selma, Ledaig		G. W. Brennan, M.Inst.C.E., Architect	do.
Shop and House, Dundalk	Messrs. P. & T. M'Cann	J. F. M'Gahon, Architect, 3, Earl-street, Dundalk	do.
Sewer, Longley-lane, Northenden	Bucklow R.D.C.	J. McKenzie, Surveyor, 7, Market-street, Altrincham	June 21
Road Works (Separate Contracts)	Lewisham Borough Council	Surveyor's Department, Town Hall, Catford	do.
Conservative Club, Edenfield		F. J. Hobson, Architect, Rawtenstall	do.
*Painting and Decorating Shoreditch Town Hall	Shoreditch Borough Council	Borough Surveyor, Town Hall, Old-street, E.C.	do.
*Paving Works	Corporation of London	Engineer to Corporation, Guildhall, E.C.	do.
*Painting, Sanitary Alterations, etc., at Infirmary	Paddington Guardians	E. Howley Sim, Architect, 8, Craig's-court, Charing Cross, W.C.	do.
*Straw Loft, etc., to Stables, Liverpool-road, N.	Islington Borough Council	Borough Engineer, Town Hall, Upper-street, N.	do.
Tar Paving, Northampton Park, N.	do.	do.	do.
*Road-making and Paving Works	Willesden District Council	Council's Engineer, Dyne-road, Kilburn, N.W.	do.
*Sewer Works, Trafalgar-sq., Regent-st., and Bond-st.	City of Westminster	Works Dept., Westminster City Hall, Charing Cross-road, W.C.	do.
*Alterations, etc., to Arthur-street Workhouse	Chelsea Guardians	Lansdell & Harrison, 66, Basinghall-street, E.C.	do.
Stores	Manchester Gas Committee	C. Nickson, Gas Department, Town Hall, Manchester	June 22
Stores	Graigola-Merthyr Co.	Offices of the Company, Swansea	do.

CONTRACTS.—*Continued.*

Nature of Work or Materials.	By whom Advertised.	Forms of Tender, etc., supplied by	Tenders to be delivered
100 lineal yds. of Walling at Depot	Wembley U.D.C.	C. R. W. Chapman, Surveyor, Public Offices, Wembly	June 22
Corrugated Building for Temporary Hospital	Liversedge and Mirfield Jt. Hos. Bd.	E. Gill, Council Offices, Mirfield	do.
Foundations, Drainage, etc., for Temporary Hospital	do.	do.	do.
Public Library, Neath	Neath Corporation	D. M. Jenkins, Borough Engineer, Neath	do.
Bacon Curing, etc., Store, Aspatria	Industrial Co-operative Society	J. Lawson, Secretary, 32, King-street, Aspatria	do.
*Erection of Small House at Islington Infirmary	Islington Guardians	W. Smith, Architect, 65, Chancery-lane, W.C.	June 23
Belgrave Sewerage (Contract No. 2)	Leicester Corporation	E. G. Mawbey, Borough Engineer, Town Hall, Leicester	do.
Eltringham Sewerage and Sewage Disposal	Hexham R.D.C.	J. E. Parker, C.E., Post Office-chambers, Newcastle-on-Tyne	do.
Granite	North Walsham U.D.C.	E. J. Simpson, Surveyor, North Walsham	do.
Bible Christian Schoolroom, Bratton Fleming	.....	39, Fort-street, Barnstaple	do.
*Extension of Isolation Hospital	Ealing Town Council	Borough Engineer, Town Hall, Ealing, W.	do.
*New Coastguard Buildings	Admiralty	Director of Works Department, 21, Northumberland-avenue, W.C.	June 24
Kitchen, Bangour Village Asylum	Edinburgh District Lunacy Board	Hippolyte J. Blanc, R.S.A., 25, Rutland-square, Edinburgh	June 2
Engineers	G.N. Ry. Co. (Ireland)	T. Morrison, Secretary, Amiens-street Terminus, Dublin	June 27
600 Tons of Granite	Braintree U.D.C.	H. H. Nankivill, Surveyor, Vestry Hall, Braintree	do.
210 yds. of Pipe Sewer	Witham U.D.C.	W. P. Perkins, Surveyor, District Council Offices, Witham	do.
Calvinistic Methodist Chapel at Groes, Penycae	.....	53, Chapel-street, Penycae, Ruabon	do.
Asphalting Yards at Workhouse	Cannock Guardians	E. C. Jones, Union Workhouse, Cannock	June 28
Passenger Carriages, etc.	Donegal Ry. Co.	General Manager and Loco. Superintendent, Stranorlar, co. Donegal	do.
*New Offices, Bishop's-road, Paddington	G.W.Ry. Co.	Engineer, Paddington Station, W.	do.
*Sewerage and Sewage Disposal Works	Watford R.D.C.	E. Lailey, 9, Market-street, Watford	do.
*Addit., Decorating Work, etc., Public Baths, Ratcliff	Stepney Borough Council	Borough Engineer, 15, Great Alie-street, E.	do.
*Enlargement of Parcel Office, Ipswich	Commissioners of H.M. Works	H.M. Office of Works, Storey's Gate, S.W.	do.
Reconstruction of Sewers, Cannon's-lane, Pinner	Hendon R.D.C.	J. A. Webb, Engineer to Council, Stanmore	June 29
*Syphon Under New River, Bounds Green-road	Wood Green U.D.C.	Council's Engineer, Town Hall, Wood Green, N.	do.
*Erection of Public Library, Herne Hill	Lambeth Borough Council	H. Wakeford & Sons, 267, Clapham-road S.W.	June 30
Painting Bridges, East Sussex	East Sussex County Council	F. J. Wood, County Surveyor, County Hall, Lewes	July 1
*New Coastguard Build'gs, Cliffe Creek, nr. Gravesend	Admiralty	Director of Works Department, 21, Northumberland-avenue, W.C.	do.
*New Coastguard Buildings at Boscastle	do.	Superintending Civil Engineer, H.M. Dockyard, Devonport	do.
Two Stone Bridges, Cotehill	Carlisle R.D.C.	J. Graham, Engineer, Bank-chambers, Bank-street, Carlisle	July
500 yds. of Flints	Steyning West R.D.C.	E. Cripps, Clerk, Council Offices, New Shoreham, Sussex	July 4
Works at Gortnasate, co. Donegal	Board of Public Works	District Office of Works, Londonderry	do.
Pipe Laying (Contract No. 6)	Bridgwater R.D.C.	Rural District Council Offices, Bridgwater	do.
C.I. Pipes (Contract No. 5)	do.	do.	do.
*Redecorating Limehouse Public Library	Stepney Borough Council	Borough Engineer, 15, Great Alie-street, E.	do.
Road Metal	Rochester Corporation	W. Banks, City Surveyor, Rochester	July 1
Reconstruction of Dorchester Wesleyan Ch. & Schools	.....	W. E. Dibben, 40, Icen-way, Dorchester	do.
Rails, Fishplates, and Bolts	Erith U.D.C.	C. H. Fry, Clerk, District Council Offices, Erith, Kent	July
Permanent Way Construction	do.	do.	do.
Secondary and Elementary Schools, Rotton Park	Birmingham Education Committee	A. Rowse, Surveyor, 3, Newhall-street, Birmingham	July 1
Road Metal	Lewes Town Council	Borough Surveyor's Office, Town Hall, Lewes	July 23
Branch Railway to Pits on Craig Estate	.....	Eglinton Iron Works Office, Kilwinning	No date.
Alteration to Nurses' Home, Withington	Chorlton Guardians	J. B. Broadbent, A.R.I.B.A., 15, Cooper-street, Manchester	do.
Schools, Blythe Marsh	Trustees, Wesleyan Methodist Ch.	W. Wood, Architect, Longton	do.
House, Gainford	.....	E. G. Besant, A.R.I.B.A., Ravenswood, Cherryhinton-rd., Camb.	do.
Clean. & Decor. Nebottle Parish Church, Fence Houses	.....	The Vicar	do.
Six Houses, Stranmillis, Belfast	.....	R. A. Boyd, Architect, 22, Lombard-street, Belfast	do.
Heating, Ventilating St. Bridge's Church, Old Trafford	Rector and Wardens	The Rector	do.
Cleaning and Redecorating do.	do.	do.	do.
Additions to St. Mary's Church, Chepstow	.....	J. Coates Carter, F.R.I.B.A., Bank-buildings, Cardiff	do.
Wind Engine and Pumps	Carlisle R.D.C.	J. Graham, Engineer, Bank-chambers, Bank-street, Carlisle	do.
Collecting Tank and Reservoir, Cargo	do.	do.	do.
1,860 yds. c.i. Water Mains, Cargo	do.	do.	do.
234 yds. of Pipes in Wet Ground	Grimsby Corporation	H. Gilbert Whyatt, Borough Engineer, Town Hall, Grimsby	do.
Road and Sewer at Fishponds	.....	W. P. Saunders, Architect, Rupert-chambers, Quay-street, Bristol	do.
Excavating and Ballasting New Streets at Penygraig	.....	Lawrence, Bassett, & Walker, 6, Park-place, Cardiff	do.
*Additions to Electricity Works	Dover Corporation	Borough Electrical Engineer, Park-street, Dover	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in
*Drawing Office Assistant	Northampton Institute, E.C.	Not Stated	June 11
*Works Foreman	Hull Corporation	150*l.*	June 20
*Clerk of Works	Staffs. Education Committee	150*l.*	June 25

Those marked with an asterisk (*) are advertised in this Number. *Competitions*, —. *Contracts*, lv. vi. viii. x. *Public Appointments*, xviii.

TENDERS.—*Continued from page 647.*

LITTLEHAMPTON.—For paving works, for the Urban District Council. Mr. H. Howard, Surveyor, Town Offices, Littlehampton. Quantities by the surveyor:—

A. C. Joan	£678	3	6	Patent Victoria Stone Co., Ltd.	£485 11 10
E. H. King	669	0	0		
D. E. Delaney	599	2	4		
A. T. Catley	584	11	10	E. G. Holland, 30, High-st., Littlehampton*	461 0 0
Grounds & Newton	555	0	5		
W. Wallis	530	10	0		

LLANELLY.—For 1,100 yards of 24-inch c.i. pipes, etc., for the Urban District Council. Mr. G. Watkeys, C.E., Town Hall, Llanelly:—

	Per ton.
C. Jordan & Co.	£4 19 10
R. Maclaren & Co.	4 17 0
T. Spittle & Co.	4 16 6
Stavely Coal and Iron Co., Ltd.	4 15 0
Macfarlane, Strang, & Co.	4 15 0
Sheepdale Coal & Iron Co., Ltd.	4 14 0
A. G. Cloake	4 13 6
Holwell Iron Co., Ltd.	4 13 0
D. F. Stewart & Co., Ltd.	4 13 0
I. & S. Roberts & Co.	4 12 6
Stanton Iron Works Co.	4 11 6
Cochrane & Co., Dudley*	4 10 0

LLANDOUGH.—For erecting a house, for Mr. J. Lloyd Roach. Mr. J. H. Thomas, Surveyor, Pentwyn, Llandaff:—

G. H. Elkington	£1,066	10	0
W. Cox	880	0	0
J. Charles	835	0	0
J. Pugh	£798	0	0
J. Britton, Dinas Powis*‡	720	0	0
T. Bevan	696	18	9

‡ Accepted at £720 (revised amount includes price for an additional bedroom).

LONDON.—For rebuilding 16, Ormond-yard, Queen-square, W.C., for Mr. W. C. Gidden. Mr. T. Wilson, architect, 34, New Bridge-street, E.C.:—

Williams	£1,700	Coleman & Co.	£1,256
Patman & Fotheringham, Ltd.	1,473	Leslie & Co., Ltd. (too late)	1,234
C. Wall & Co., Ltd.	1,337	J. Chessum & Son*	1,195
Lidstone	1,282		

LONDON.—For the erection of casual wards and receiving workhouse at Sheffield-st. and Portsmouth-st., W.C., for the Guardians of the Poor of the Strand Union. Mr. A. A. Kekwich, architect, 18, Outer Temple, W.C.:—

J. F. Holliday	£31,000	Treasure & Son	£27,597
Leslie & Co.	29,735	F. G. Minter	27,596
Wells & Co.	29,561	H. L. Holloway	27,430
Appleby & Sons	28,790	A. Monk, Lower Edmonton*	26,739
W. Wallis	28,400	Page & Son	26,300
Foster Brothers	28,376		
Lawrence & Son	28,292		

LONDON. — For additions to Fairfax Dancing Academy, Portland Gardens, Harringay, N. Messrs. Warran & Stupart, architects, 78, Grand-parade, Green Lanes, N.:—

J. C. Haward	£1,536 5 3	C. Hale & Co.	£985 0 0
W. Lawrence & Son	1,169 0 0	W. Simmonds	955 0 0
J. Middleton	1,025 0 0	Rowley Bros., Tottenham*	900 0 0
E. G. Benson	1,024 11 0		

[Architects' estimate, £984.]

LONDON.—For erecting a verandah outside the infants' nursery at workhouse, Reeves-place, N., for the Guardians of the Poor of the Parish of St. Leonard, Shoreditch. Mr. F. J. Smith, architect, Parliament-mansions, Victoria-street, S.W.:—

J. Ivory, 102, Great-Cambridge-street, E. £259 15

LONDON.—For 345,000 Jarrah wood paving blocks, for the St. Pancras Borough Council. Mr. W. N. Blair, Engineer and Surveyor, Town Hall, St. Pancras:—

	5-in. Jarrah blocks, per 1,000.	4-in. Jarrah blocks, per 1,000.
Improved Wood Pavement Co.*	£11 2 6	£9 2 6
W. Griffiths	11 9 9	9 7 0
Acme Flooring & Paving Co.	11 6 0	9 2 0
Millar's Karri & Jarrah Co.	11 15 6	9 12 6
B. G. Elliott	11 13 0	9 9 0

LONDON.—For the extension of the Telegraph Factory at Holloway, for the Commissioners of H.M. Works and Public Buildings:—

	£ s. d.	Credit Old Materials. £ s. d.
H. Lovatt, Ltd.	10,900 0 0	55 0 0
Stephens, Bastow, & Co., Ltd.	9,584 0 0	—
G. Newton	9,195 0 0	9 0 0
C. Miskin & Sons	8,882 0 0	60 0 0
W. J. Renshaw	8,724 0 0	50 0 0
H. L. Holloway	8,600 0 0	28 0 0
J. Mowlem & Co., Ltd.	8,290 0 0	—
J. C. Richards & Co.	8,225 0 0	50 0 0
J. Appleby & Sons	8,210 0 0	100 0 0
Perry & Co.	8,194 0 0	70 0 0
J. Wilmott & Sons	8,176 0 0	50 0 0
L. Whitehead & Co., Ltd.	8,150 0 0	50 0 0
C. Ansell	8,080 0 0	100 0 0
W. Jones & Sons, Ltd.	8,012 5 4	50 0 0
W. Pattinson & Son	7,981 0 0	43 0 0
C. P. Roberts	7,899 0 0	48 0 0
F. & A. Willmott	7,868 0 0	35 5 0
Leslie & Co., Ltd.	7,849 0 0	162 0 0
Galbraith Bros.	7,788 0 0	88 0 0
Cowley & Drake	7,704 0 0	109 0 0
B. E. Nightingale	7,509 0 0	35 0 0
Perry Bros.	7,477 0 0	100 0 0
Foster Bros.	7,315 0 0	100 0 0

NAPSBURY (Herts).—For electric [wiring and fittings at Napsbury Asylum, near St. Albans, for the Visiting Committee. Mr. W. H. Massey, M.Inst.C.E., 25, Queen Anne's-gate, Westminster, S.W.:—

Hampton & Sons	£11,955	0	Wenham & Waters, Ltd.	£6,549	0
F. Suter & Co., Ltd.	9,274	0	W. J. Fryer & Co.	6,163	0
Wippell Bros. & Row	8,000	0	Belshaw & Co.	6,000	0
Allom Bros.	7,769	14	Wells, Rayner, & Co.*	5,343	0
Comyn, Ching, & Co.	7,700	0	H. H. & J. Pearson, Ltd.	5,022	0
Simmonds Bros., Ltd.	7,438	0	T. Potter & Sons	4,496	0
Strode & Co.	7,287	0	Jones & Spence	3,200	0
D. Hulett & Co., Ltd.	7,062	0			

PLYMOUTH.—For fitting-up hot-water heating apparatus and gas installation at the Technical Schools, for the Education Authority. Mr. H. J. Snell, architect, 11, The Crescent, Plymouth:—

W. T. Hocking, Saltash-street £820

PORTH.—For enlarging the Tabernacle (English) Baptist Chapel, Hannah-street, for the Trustees of the Chapel. Mr. D. W. Jones, architect and surveyor, Porth:—

C. Jenkins & Son	£1,770	R. Burnell, Builder, Ynyshir, Porth*	£1,280
Moore & Elsworthy	1,650		

RIPON.—For erecting sulphur baths in Park-street, for the Corporation. Mr. S. Stead, architect, Victoria-chambers, James-street, Harrogate:—

Mason and Bricklayer: Barker Bros., Hampsthwaite	£2,560 0 0
Carpenter and Joiner: J. H. Coldbeck, Ripon	854 10 0
Plumber and Glazier: S. Rushworth, Shipley	830 0 0
Plasterer: Fortune & Calverley, Harrogate	217 15 0
Slater: Baynes & Beck, Ripon	170 0 0
Painter: J. S. Lowley, Ripon	110 0 0

SENGHENYDD.—For building a Welsh church at Senghenydd, near Cardiff, for the Trustees. Mr. P. Vivian Jones, architect and surveyor, Hengoed, near Cardiff:—

With Excavation.

D. C. Jones £772 10 10

Without Excavation (30l. extra for Excavation).

J. Williams £661 0 0

Without Excavation (25l. extra for Excavation).

R. Jones, Abertridwr* £638 10 0

[The members of the church have undertaken to do the excavation so as to save this expense.]

SHEFFIELD.—For heating apparatus for Malin Bridge Council School, for the Sheffield Education Committee. Mr. H. I. Potter, architect, 115, Norfolk-street, Sheffield:—

Dargue, Griffiths, & Co.	£551	0	Brightside Foundry and Engrg. Co., Ltd.	£319	0
J. W. Wilson	448	7	Wright Bros.	315	0
Bates & Sons	429	0	Newton Chambers & Co., Ltd.	306	10
Sheen, Stanley, & Co.	425	0	Braithwaite & Co., Carver-street, Sheffield*	280	0
A. Grindrod & Co.	420	0			
C. Pearce & Son	407	0			
H. Harvey	355	0			

SOUTHWICK (Sussex).—For extension of sewer in Church-lane, for the Urban District Council. Mr. G. W. Warr, Surveyor to Council, Southwick. Quantities by Surveyor:—

D. & J. Hall	£229	18 7	J. Parsons & Sons	£156	0 0
J. Whittington	185	1 0	Peerless, Dennis, & Co., Langney-road, Eastbourne*	142	10 0
W. Whiteman	181	13 6			
W. A. McKellar	178	0 0			
J. G. Pickhard	177	19 6			
A. E. Soan‡	162	1 7			
E. H. King	159	1 9			
Woolgar Bros.	158	1 0			

‡ £10 should be added for contingencies.

STAINLAND.—For paving works, Station-road, for the Stainland-with-Old Lindley Urban District Council. Mr. J. H. Walker, Surveyor, Mechanics' Hall, Stainland:—

Halstead & Bainbridge, Claremount, Halifax*
Spencer Bros., Skircoat, Halifax
Longbottom & Davidson, King Cross, Halifax
R. Bowers, Halifax
S. Bedford & Son, Huddersfield-road, Halifax
Bellfield & Barnes, Lord-street, Sowerby Bridge
Sidebottom & Brown, Cleckheaton
Hill & White, Woodlands Mount, Huddersfield

} At a Schedule of Prices.

STRETFORD.—For a 400 K.W. steam-driven generator, for the Urban District Council. Messrs. T. L. Miller & Wilson, consulting engineers, 19, Brazenose-street, Manchester:—

Lancashire Dynamo & Motor Co., Ltd., Trafford Park, Manchester* £2,663

TREHARRIS.—For erecting thirteen houses, for the No. 2 Oakland Building Society. Messrs. Osborne & Rees, architects and surveyors, Nelson, Glam.:—

W. & D. Thomas, builders, Bedwas, Mon. £2,899

TUNSTALL.—For painting, decorating, etc., at Wesleyan Chapel, Wesley-place, for the Trustees. Mr. E. Jones, architect, 10, Albion-street, Hanley:—

W. H. Hawthorne	£550	0 0	A. Parr	£371	11 1
J. Moulton	470	7 6	J. Birchall	356	6 0
T. Hughes	446	5 2	Bennett Bros.	352	0 0
G. H. Moreton & Son, Ltd.	433	16 9	T. Adams, Hanley*	297	15 0
			G. Cross	292	6 10

[Based on quantities supplied by Architect.]

UPTON PARK.—For repairs to schools, for the St. George-in-the-East Guardians:—

H. C. Horswill, Green-street, Upton Park £249

WESTON-SUPER-MARE.—For new roads, drains, etc., on Bourneville Estate, for Mr. J. L. Poole. Messrs. Wansbrough, Sons, & Garner, surveyors. Quantities by Mr. J. S. Garner, Weston-super-Mare:—

W. A. Green	£1,149	Coles & Son	£854
Sprake	990	E. Monks	790
P. Hart & Son	905	Lloyd & Son, Weston-super-Mare*	750
Mereweather & Sons	899		

WINSFORD.—For erecting new stores at Newton Bank, for the Industrial Co-operative Society. Mr. T. Dutton, architect, Dingle-lane, Winsford:—

J. Fowles & Sons	£725 0	Birchall Bros., Middlewich*	£597 10

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